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ELECTRICAL REVIEW 10th OCTOBER, 1952

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3907

Electricity Supply Trends

THE fourth annual report of the British Electricity Authority reveals that while the Authority itself earned a higher net surplus in 1951–52 than in the preceding year (£4·25 million against £2·64 million) the fourteen Electricity Boards had a combined deficit of £1·33 million against a net surplus of £3·69 million in 1950–51. This is easily accounted for: in a period of rising costs the Authority can quickly increase its charges to the Boards but the raising of prices to consumers by the Boards is a long process. This is particularly true at a time when standardization of tariffs is being proceeded with, for some Boards have preferred to seek their higher revenue by setting their new charges at remunerative levels and the time-lag is thereby lengthened. In 1950–51 only four Boards incurred net deficits; last year double that number were "in the red." Their experiences show remarkable differences. Three of them—Eastern, South Wales and North Western—substantially improved their positions. The first seems to have benefited from a timely increase of charges; the South Wales and North Western Boards showed the highest percentage increases in sales (12·5 and 13·1 respectively)—particularly on the industrial side. The overall increase for the fourteen Boards was 8·3 per cent. The London Board reported the smallest proportional increase (5·4 per cent) and its net surplus was halved. The most striking reversal of fortune was experienced by the East Midlands Board whose 1950–51 surplus of £376,000 was turned into a deficit of £826,000—the greatest of all. Yorkshire, too, was badly hit, a surplus of £652,000 being converted into a loss of £196,000.

To explain the fall in the rate of advance in the sale of electricity, from 12·3 per cent in 1950–51 to 8·2 per cent in 1951–52, the B.E.A. mentions milder winter weather, improved domestic fuel supplies and reduction of consumers' purchasing power. The last was reflected in the reduced scale of appliance sales which, of course, affected other electrical retailers. Nothing is said of the

effects of anti-electric propaganda, but perhaps such a reference would have been out of place in a report to the Minister of Fuel and Power. The fact remains that this has had an adverse effect and one which has made itself felt more since the end of the period reviewed by the report as has been indicated by the monthly statistics issued since that date. The report is a warning to the electrical industry that it must bestir itself if it is to resume the rate of progress to which it was accustomed in the past or even to hold what it has gained. And this must be done in the face of rising electricity prices, for it is quite certain that improved efficiency alone cannot counter the upward move of costs, although the electricity supply authorities must relieve the position by improving their methods and introducing economies wherever possible.

LIGHTING BAN ENDED

Giving as a reason the better coal-stock and power-plant position, the Minister of Fuel and Power has decided to end the restrictions on shop lighting and illuminated signs which ordinarily would have come into force again last week-end. Reliance is to be placed on voluntary co-operation to prevent excessive peak-hour burdens. It is to be hoped that this is the real end of what was, after all, a measure of very doubtful value. In fact it was widely considered in the electrical industry to be a sop to those who regarded such lighting as anti-social.

HOME ACCIDENTS

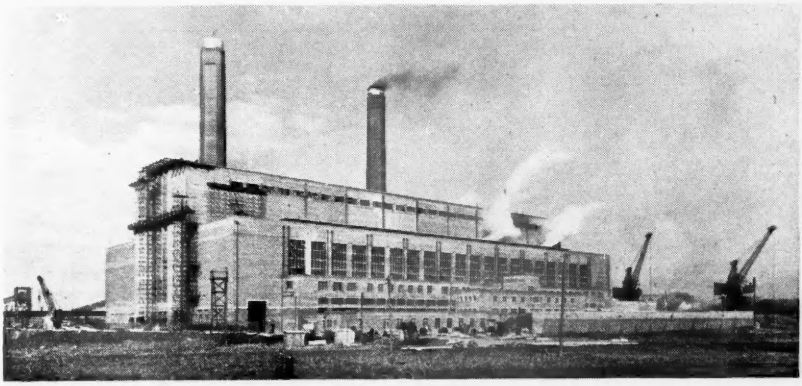
Seen in relation to the growth in the use of electricity in over 12 million homes, the 38 fatalities due to shock in 1951 indicate a declining hazard. The number is smaller than in the previous year, when it was 42, and is but a fraction of those from other causes. Nevertheless improvement is possible, as the Home Office analysis reviewed in this issue shows. Flexible leads and connectors (10) head the list of items involved. Heaters (6) follow, mostly in bathrooms, while portable tools and table lamps (3 each) come third. Of contributory causes, the handling of faulty appliances and connections in non-earth-free situations (23) were most frequent. Amateur construction or repairs (14) were also prominent. Clothing set alight by unguarded fires (27) was regrettably the same in number as in the year before.

LARGER GENERATING SETS

A valuable feature of Anglo-American technical co-operation is that electrical developments in one country can be adopted in the other, if suitable to circumstances there, in the confidence which comes from the knowledge that they have received extended trials under working conditions. An article in this issue, discussing recent power station practice in the United States, pays especial attention to the trend towards generating sets of larger ratings there than are at present contemplated in Great Britain and their effects in lowering capital costs, in expediting production, and maintenance.

WILLIAM RAMSAY

The debt owed by the electrical industry to Sir William Ramsay, the centenary of whose birth fell last week, is best shown in the growing uses of the rare gases in illumination more than half a century after their discovery. At the British Electrical Power Convention in June, Dr. J. N. Aldington mentioned argon as the principal constituent of the gas in filament lamps, krypton (of very low thermal conductivity) in small miners' lamps to give up to 20 per cent greater light output, and xenon for flash tubes in photography. Neon has added to its value for signs through the use of the ultra-violet lines in its spectrum to excite fluorescent coatings and in hot-cathode floodlighting.



Electricity Supply in 1951-52

The B.E.A.'s Fourth Report

IN the year ended 31st March last the British Electricity Authority and the fourteen Area Boards increased their sales to consumers by 8·2 per cent. The 1950–51 increase was 12·3 per cent and that for 1949–50 6·2 per cent. Total sales were 50,416 million kWh and the division of this among the various classes of consumers is set out in Table I. The total sent out from the power stations during the year was 55,823 million kWh, an increase of 6·4 per cent.

It will be seen from the table that there was a 3·3 per cent increase in the number of consumers, to 13,503,733; the corresponding increase in 1950–51 was 3·6 per cent. There was a substantial decline in the sale of electricity for street traction and a small one in the case of rail traction. The biggest rise in number of consumers and sales occurred in the farming section; public lighting sales also made a great advance.

Industrial sales recorded an increase of nearly 10 per cent (against 11·8 per cent in the preceding year) but domestic consumers increased their purchases by only 7·1 per cent, as compared with 12·0 per cent in 1950–51. In its fourth report, from which these figures are taken, the British Electricity Authority attributes this to milder weather in the latter part of the year, an improvement in the solid fuel situation and increased pressure on consumers' incomes. Table II is a review of the sales by the individual Electricity Boards. The report shows that the supply load factor varied between 42 per cent for the London Board to as much as 63 per cent in the case of the South Wales Board. High figures were also shown by the North

Table I.—Consumers and Sales

Class	Number of consumers 31.3.52	Per cent inc. or decrease on 1950–51	Sale of electricity 1951–52 (million kWh)	Per cent inc. or decrease on 1950–51
Industrial	159,542	2·1	25,242	9·9
Commercial	1,341,601	2·0	6,784	6·5
Farm	120,121	8·8	570	17·8
Domestic	11,878,312	3·4	15,954	7·1
Traction	73	−7·6	—	—
Rail*	—	—	914	−0·8
Street	—	—	496	−5·3
Public lighting	4,084	6·5	456	9·6
Total†	13,503,733	3·3	50,416	8·2

* Including direct sales by the B.E.A.
† Excluding small supplies to N. of Scotland Board.

Above: **General view of south aspect of North Tees "C" power station in North Eastern Division**

Table II.—Analysis of Electricity Boards' Sales

Board	Population (thousands)	Number of Consumers (thousands)	Sales of Electricity (thousands of kWh)						
			Domestic	Farm	Commercial	Industrial	Public lighting	Traction	Total (excluding inter-Board sales)
London ..	5,121	1,641	1,976,136	402	1,249,741	1,268,813	80,937	91,697	4,667,726
S. Eastern ..	3,220	984	1,394,449	15,062	426,696	738,813	31,978	20,208	2,657,206
Southern ..	3,776	1,036	1,328,098	66,004	602,238	1,068,227	25,461	16,312	3,106,340
S. Western ..	2,126	600	677,431	38,655	280,487	479,873	16,026	—	1,492,472
Eastern ..	4,757	1,385	1,931,055	89,424	598,576	1,595,735	34,329	128,866	4,377,985
E. Midlands ..	3,660	1,041	1,211,578	61,518	365,122	2,087,138	24,562	25,909	3,775,827
Midlands ..	4,103	1,108	1,436,638	61,097	621,526	3,096,325	25,992	37,853	5,333,398
S. Wales ..	1,978	490	423,296	9,764	156,618	2,379,810	17,585	10,664	2,997,737
Mersey and N. Wales ..	2,834	730	857,380	35,796	370,802	1,763,628	21,324	81,825	3,167,700
Yorkshire ..	4,163	1,127	1,281,493	27,355	501,713	3,185,298	35,521	124,273	5,158,653
N. Eastern ..	2,971	780	656,412	20,257	303,641	2,187,295	20,327	68,505	3,256,437
N. Western ..	4,560	1,403	1,636,748	60,537	667,481	3,465,055	50,014	63,707	5,943,542
S.E. Scotland ..	1,328	350	341,319	16,241	179,248	486,755	15,672	32,981	1,072,216
S.W. Scotland ..	2,573	729	798,550	38,154	369,147	1,440,880	56,339	—	2,703,070
Totals	47,170	13,504	15,953,583	570,266	6,696,036	25,213,645	456,067	702,800	49,710,309

Eastern Board (56 per cent) and the Merseyside and North Wales Board (55 per cent).

Although the Central Authority itself was able to show a net surplus of £4,251,640 (against £2,635,191 in 1950–51) the Area Boards as a whole incurred a net deficit of £1,332,803 (against a surplus of £3,691,986 in 1950–51). There was thus a consolidated net surplus of £2,918,837. To this is added £4,811,073 brought forward, making £7,729,910. Taxation reserve receives £2,300,000 and contributions to the central reserve fund amount to £2,283,672. From Area reserve funds £1,862,960 is credited and a balance of £5,009,198 is carried to the balance sheet.

The Central Authority's total income was £172·96 million (against £148·88 million in 1950–51) of which sales of electricity accounted for £172·46 million (£148·45 million) and steam for £0·50 million (£0·43 million). Sales to Boards were valued at £169·71 million (£148·92 million) and sales to railways, etc., at £2·75 million (£2·53 million).

The costs (in millions) were as follows:—Generation works costs £122·71 (£106·44); purchase of electricity £2·01 (£1·25); main transmission—operation, repairs and maintenance £1·45 (£1·31); rents, insurances, etc. £0·84 (£0·67); payments in lieu of rates £5·76 (£5·24); administration and general expenses £6·10 (£5·34); depreciation of fixed assets £16·36 (£14·59). This leaves a net trading surplus of £17·72 (£14·02) and after adding the miscellaneous income and deducting interest (£12·51), etc., there is, as stated, a net surplus of £4·25 million.

Table III.—Area Boards' Revenue and Expenditure

Board	Total Income		Total Expenditure		Net Surplus or Deficit	
	1950–51	1951–52	1950–51	1951–52	1950–51	1951–52
	£	£	£	£	£	£
London	30,527,960	32,596,861	29,458,024	32,098,063	1,069,936	498,798
South Eastern	15,422,525	17,225,912	15,227,931	17,322,986	191,594	— 97,074
Southern	18,110,076	19,663,364	17,327,382	19,596,649	782,694	66,715
South Western	8,421,091	9,523,164	8,497,185	9,664,973	— 76,094	— 141,809
Eastern	23,196,130	26,339,297	23,100,478	26,211,131	95,652	128,166
East Midlands	17,145,125	18,409,001	16,768,631	19,234,784	376,494	— 825,783
Midlands	22,653,300	25,418,407	22,668,980	26,079,141	— 15,680	— 660,734
South Wales	10,490,497	12,294,228	10,248,840	11,970,102	241,657	324,126
Merseyside and N. Wales ..	14,291,107	15,730,834	13,991,583	15,626,017	299,524	104,817
Yorkshire	20,725,436	22,840,945	20,072,974	23,037,414	652,462	— 196,469
North Eastern	13,193,338	14,828,935	13,103,154	15,351,370	90,184	— 162,247
North Western	24,887,636	29,283,806	25,025,823	29,059,418	— 138,187	224,388
S.E. Scotland	5,138,038	5,476,078	4,913,195	5,589,708	224,843	— 113,630
S.W. Scotland	11,209,998	12,625,959	11,316,091	13,108,026	— 106,093	— 482,067
Totals (excluding inter-Board bulk supplies)	234,323,462	261,169,741	230,631,476	262,502,544	3,691,986	— 1,332,803

A summary of the Electricity Board's accounts is given in Table III. From this it will be seen that eight of the Boards had adverse net balances; in 1950–51 only four showed deficits. Table IV deals with the Board's trading and contracting activities and shows a rise in revenue but a substantial fall in the surplus.

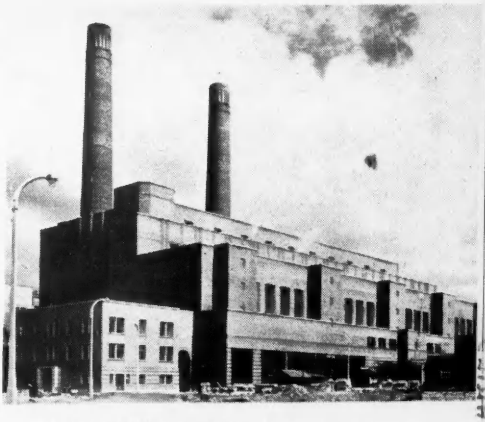
Commenting on the contracting work and sales of "fittings" by the Electricity Boards, the report points out that although there was an overall increase several Boards showed decreases. As in previous years, the Eastern Board reported the highest total sales (£4·62 million) although it was closely approached by the Midlands Board (£4·48 million). These two Boards between them accounted for nearly a third of the aggregate sales by all Boards.

The revenue per kWh sold during the year was 1·220d (against 1·181d in 1950–51). Average revenue from domestic consumers was 1·353d (against 1·327d), from farm consumers 1·339d (1·322d), from commercial consumers 1·760d (1·726d), from industrial consumers 1·002d (0·948d), from public lighting 1·269d (1·225d) and from traction 0·977d (0·925d).

Costs per kWh sold of generation and purchase of electricity rose from 0·557d to 0·596d due particularly to higher fuel costs which, however, were partly offset by improved generating efficiency. Combined expenditures rose from 1·188d to 1·242d per kWh sold. Combined revenues also rose, as a result of tariff increases, from 1·221d to 1·256d per kWh sold. The effect of tariff increases was, however, mitigated by increased consumption under block and two-part tariffs which had the effect of reducing the average price to many consumers.

Dealing with the question of depreciation, the Authority adheres to its view that no basis for providing for the depreciation of assets other than by reference to "historical" cost is appropriate and that any further provision towards higher costs of replacement must be derived from surplus.

It is stated that no liability to profits tax will arise until 1954–55 and that income tax and excess profits levy liability will be deferred for some years after that. Nevertheless the Authority is to continue to contribute to taxation reserve until it is sufficient to meet the liabilities deferred by reason of initial allowances when the demand arises.



External view of Westwood (Lancs) power station, North Western Division

The consolidated balance sheet of the Authority and Boards shows written-down fixed assets valued at £734·80 million (gross fixed assets were £1,291·60 million); net interests in subsidiary companies and investments £20·77 million; compensation for undertakings vested in the North of Scotland Hydro-Electric Board £8·47 million and obligations to local authorities £1·59 million; net current assets £59·55 million; and intangible assets £43·49 million. The total capital liabilities are £726·87 million (including £591·31 British Electricity Stock); temporary borrowings £121·00 million; and reserves and revenue balances £20·80 million.

Borrowing powers are restricted to £700 million (apart from compensation stocks and compensation payments to local authorities) and at 31st March last a balance of £329 million remained but was substantially hypothecated. It will, therefore, be necessary in due course to seek approval to the extension of borrowing powers.

Capital expenditure during the year amounted to £141·68 million (£89·66 million relating to the Authority and £52·02 million to the Boards)—an increase of £13·01 million over the previous year.

Particulars are given of the proceeds received from the liquidation of a number of subsidiaries.

Upon the subject of private generating plant the Authority does not consider that in general, and as a long-term policy, the

Table IV.—Electrical Contracting and Sales of Fittings

Board	Sales		Direct Costs		Indirect Costs		Surplus	
	1950–51	1951–52	1950–51	1951–52	1950–51	1951–52	1950–51	1951–52
	£	£	£	£	£	£	£	£
London	2,223,250	2,642,336	1,816,750	2,145,544	342,596	375,458	63,904	121,334
South Eastern ..	1,937,264	2,058,857	1,519,951	1,634,643	345,533	402,082	71,780	22,132
Southern	2,498,391	2,739,769	2,014,626	2,207,693	423,595	505,784	60,170	26,292
South Western ..	1,553,159	1,679,819	1,214,026	1,316,042	336,893	386,380	2,240	(—)22,603
Eastern	4,422,065	4,619,623	3,613,615	3,830,957	659,171	700,347	149,279	88,319
E. Midlands ..	1,603,112	1,445,003	1,282,425	1,164,073	206,420	245,947	114,267	34,983
Midlands	3,669,867	4,479,575	2,947,839	3,614,774	566,068	697,804	155,960	166,997
South Wales ..	833,286	899,805	700,737	746,125	119,190	151,324	13,359	2,056
Merseyside and N. Wales	1,225,592	1,255,171	985,707	1,012,221	209,697	220,166	30,188	22,784
Yorkshire	1,847,898	2,340,594	1,500,412	1,982,229	221,947	265,281	125,539	93,084
North Eastern ..	1,016,223	1,088,338	858,953	933,188	76,269	92,598	81,001	62,552
North Western ..	2,548,292	2,739,793	2,088,863	2,240,514	315,130	361,250	144,299	138,029
S.E. Scotland ..	487,303	494,078	379,138	391,790	75,705	90,957	32,460	11,331
S.W. Scotland ..	493,449	486,927	409,191	409,817	60,354	66,894	23,904	19,216
Totals ..	26,359,151	28,969,688	21,332,233	23,620,910	3,958,568	4,562,272	1,068,350	786,506

installation of such plant is economic and in the national interest. But where steam requirements are substantial the installation of back-pressure generating plant may effect economies. To obtain the best results the plant should be operated in parallel with the public supply system and it is recommended that all such projects should be examined in consultation with the Boards concerned.

Load Control

It was found that the two districts (in Merseyside and South West Scotland) selected for large-scale tests of central load control equipment were not suitable and two other districts were therefore considered. In the meantime the tests are held up until a joint "working party" set up by the Minister of Fuel and Power has made a further inquiry into the subject.

Work has continued on the standardization of electrical appliances and accessories. Representatives of the B.E.A. and Boards on B.S.I. committees have collaborated with manufacturers in preparing and publishing standards for domestic irons, kettles, heating pads and cooker control units, and draft standards for toasters, coffee percolators, blankets and fluorescent lamp control gear. The Joint Domestic Cooker Committee, representative of the Authority, the Area Boards, E.D.A. and B.E.A.M.A., studied various aspects of the design of electric cookers including the temperatures of external surfaces, the calibration of thermostats, the interchangeability of replacement parts, the production of adequate supplies of spare parts and the standardization of winding voltages.

Regarding relationships with electrical contractors, the report records "good accord" during the year, although the contractors expressed some doubts about the Boards' interpretation of the "statement of agreed principles." Discussions have been resumed centrally between the Authority, the Boards and the contractors to consider these matters and future relationships.

The Organizing Committee appointed to arrange the establishment of a National Inspection Council reached agreement and a draft report was submitted to the interested parties. At the end of the year it was expected that a revised draft of the report would shortly be submitted for consideration.

A "working party" set up by the Authority to consider a minimum code of wiring practice derived from the I.E.E. Regulations has prepared a draft code which is receiving consideration.

Utilization Research

In the sphere of utilization research further large-scale field tests were made on the characteristics of the domestic cooking and water-heating loads. Other tests related to immersion heaters, off-peak water heaters for central control and the electric heating of office buildings, and cost research activities were also pursued.

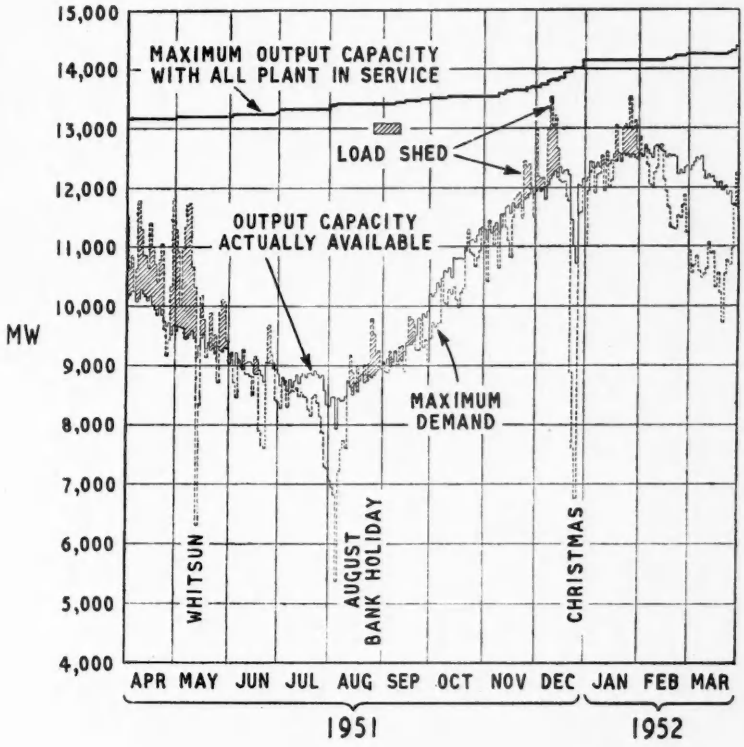
The report includes a statement on national fuel and power policy based on the evidence presented by the B.E.A. to the Ridley Committee.

At the close of the year the Authority employed 47,933 people and the Area Boards 131,297—a total of 179,230 of

whom 11·7 per cent were women. Of the total 67 per cent were in the manual grades and the remainder in the engineering, administrative and clerical grades. The number showed an increase of 1·7 per cent during the year and this increase is regarded as small having regard to the expansion of capacity, and the larger number of consumers and larger volume of sales. Staff matters are dealt with in some detail in the report.

Among miscellaneous matters briefly touched on is relations with manufacturers. It is said that considerable advance was made in the settlement of outstanding price questions and one manufacturing association accepted the principle of an investigation of manufacturing costs by independent accountants.

Joint discussion on commercial and technical questions continued with the principal manufacturers' associations. Among other things, the Joint Committee of the B.E.A. and Boards with B.E.A.M.A. kept under continuous review the effects of raw material shortage on plant programmes and distribution development. Revised material price indices for electrical contracts were agreed and the Committee kept contract conditions under review.



PLANT CAPACITY AND SYSTEM DEMAND, 1951–52

The diagram shows, for the half-hour of maximum demand on each day (excluding Saturdays and Sundays) the output capacity of all generating plant in service, the output capacity available, and the demand actually supplied. The difference between maximum output capacity and output capacity available is accounted for by breakdown, overhaul, unsuitable fuel and other causes. The shaded areas show the amounts of demand which could not be supplied, i.e., the estimated amounts of load reduction due to reduction of frequency and to load shedding by reduction of voltage or disconnection of supply

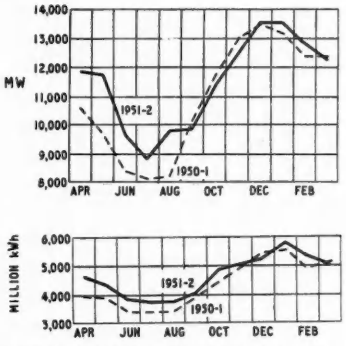
Reference is made to three contracts entered into by the Electricity Boards for bulk supplies from outside concerns.

Progress made in the standardization of tariffs is reported. Standard domestic tariffs had been published by eleven Boards by the end of the year and nine Boards had completed some or all of their standard tariffs for farm, commercial and industrial supplies.

Generation

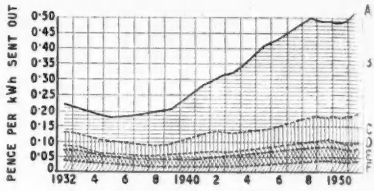
At 31st March the Central Authority owned 293 power stations which contained 15,769 MW of generating plant, including 1,275 MW of new sets distributed among 28 power stations. Their effective output capacity, allowing for auxiliaries, removal of old plant to make room for new, revision of ratings and various technical limitations, amounted to 14,214 MW. Over two-fifths of the number of generating sets and boilers (14·6 per cent of the total installed capacity) were more than 25 years old, having been retained in service owing to plant shortage.

Ten new power stations were brought into partial service and at the end of the twelve months 41 new stations and 37 extensions to existing stations were being built or planned under construction programmes up to and including 1957. Power station capital contracts approved by the Authority in 1951–52 amounted to £89 million compared with £85 million in the previous year.



MONTHLY MAXIMUM DEMAND AND MONTHLY OUTPUT, 1951–52

The two upper curves show the average demand (whether wholly supplied or not) over the half-hour of maximum demand in each month. The two lower curves show the quantity of electricity sent out in each month



WORKS COSTS PER kWh SENT OUT AT STEAM POWER STATIONS, 1932–52

A. Total works costs. B. Fuel, excluding transport. C. Fuel transport. D. Fuel handling, etc. E. Repairs, maintenance, oil, water and stores. F. Operation salaries and wages

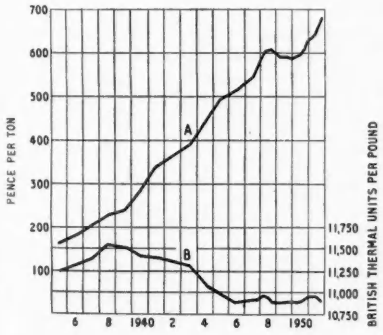
In five of the new stations turbine steam conditions are 600 to 650 lb/sq in and 825 to 850 deg F; in the other five they are 900 lb/sq in and 900 to 925 deg F. Except at Nechells "B," their boilers are fired with pulverized fuel. New power station sites are being located with especial reference to the developing East Midlands coal field and in conjunction with the new 275 kV grid. The Authority and the National Coal Board are each building a power station designed to burn slurries and washery rejects, which cannot be economically transported. To assist in overcoming the present plant shortage, 100 MW of diesel generators, which can be installed comparatively quickly, have been ordered.

Steam stations provided all but 1 per cent of the electricity generated by the B.E.A. Their average overall thermal efficiency improved to 22·04 per cent from the 21·54 per cent of the previous year, accompanying a reduction in coal consumption per kWh sent out to 1·417 lb from 1·468 lb. Average works costs rose from 0·4894 in 1950–51 to 0·5296 in 1951–52, due mainly to an increase of 11·1 per cent in the delivered cost of fuel. Nearly 34½ million tons of coal with a calorific value of 10,928 B.Th.U./lb were consumed, costing 56s 3d a ton delivered, against 32½ million tons with a calorific value of 10,948 B.Th.U. costing 50s 9d a ton in 1950–51. For an increase in total fuel consumption of 4·5 per cent, the corresponding increase in electricity generated was 6·6 per cent. Coal stocks reached a maximum of 5·16 million tons in November, an average of six weeks' winter consumption, and fell to 3·9 million tons at the end of February. A table of thermal efficiencies (sent out) of the leading

20 stations for the twelve months ended 31st March shows variations from that previously issued (*Electrical Review*, 9th May), giving Dunston "B2," Littlebrook "B" and Stourport "B," the foremost positions with 29·59, 29·31 and 28·67 per cent. The first two employ the reheat cycle. Work has begun on the new Castle Donington station which will ultimately have six 100 MW sets on the unit system with steam conditions of 1,500 lb/sq in and 1,050 deg F. Ferrybridge will have three 100 MW sets employing the reheat cycle at 1,500 lb/sq in and 975 deg F initial conditions. Similar plant is contemplated for two other stations in the 1957 and 1958 programmes.

The Grid

At the close of the period under review the grid comprised 4,600 route miles of main transmission lines, of which 4,105 miles (including 62 miles of underground cables) were at 132 kV. The transformer capacity was 16,703 MVA in 284 grid substations. During the year there were 374 system faults compared with 352 in 1950–51; 90 per cent were cleared correctly compared with 87·7. Major transmission works put in hand during the year included 145 route miles at 132 kV and 218 route miles at 275 kV. The value of contracts placed was £27·7 million, of which £10·6 million related to the new 275 kV grid. A number of 132 kV lines will have 0·4 s.c.a. conductors instead of the normal 0·175 sq in.



COST AND CALORIFIC VALUE OF COAL AT STEAM POWER STATIONS, 1935–52
(Twelve-months running averages; all figures plotted at middle of period)

A. Average delivered cost of coal consumed (pence per ton). B. Average calorific value of coal consumed (B.Th.U. per pound)

Average delivered cost (A) and average calorific value (B) of coal consumed during the twelve-month periods ending on 31st December, 1935–47, and on the last day of each quarter in subsequent years

An interim report on the technical and economic aspects of a suggested submarine cable connection with the French electrical system has been submitted to the Government. Orders have been placed for 7,500 MVA 275 kV switchgear. Two of five indoor 132 kV switching stations (the first in this country) were brought into commission. Air-blast and modified bulk-oil circuit breakers have been tested at 3,500 MVA. Forty-two 120 MVA 132/275 kV auto-transformers have been ordered for 1955 and 1956.

Owing to the length of some 275 kV spans, Post Office circuits cannot be used for intertripping, which is to be done by new carrier current systems. General particulars are given of the numerous research activities carried out by the Authority at its Leatherhead laboratory and elsewhere and in co-operation with other research organizations.

Peak Demand

Power cuts numbered 79 against 101 in the previous year. During the six winter months disconnection of consumers was necessary on only six occasions compared with 86 in the corresponding period of 1950–51. This was due to early completion of plant overhaul in lighter months, better industrial load spreading, change over to armaments manufacture, recession in textile industry and steel shortage, improved domestic solid fuel supplies and milder weather. These factors improved the plant-load position by nearly 1 million kW. The maximum potential demand of 13,536 MW occurred on Tuesday, 11th December, when 12·6 per cent of plant output capacity was out of commission, so that only 12,344 MW could be met. The pattern of load shedding changed from that of previous years, since 74 of the supply disconnections occurred during the summer months when plant was being overhauled, as against 22 in 1950–51. The load factor over the year based on maximum demand supplied fell from 52·6 per cent in 1950–51 to 50·9 per cent in 1951–52 and that based on maximum potential demand (i.e., demand actually met plus estimated load reduction by lowering frequency and voltage and cutting off consumers) rose from 44·9 to 47·4 per cent.

The reports of the fourteen Area Electricity Boards are published simultaneously with that of the Central Authority. We propose to deal with these in subsequent issues.

MINISTER'S REPORT

Accompanying the B.E.A. and Board reports is the statutory report of the Minister of Fuel and Power upon his "electrical" activities in 1951–52.

Consents were given to the construction of power stations at Castle Donington (near Derby), Ince (near Chester), Marchwood (near Southampton), Stella North and Stella South (near Newcastle-on-Tyne) and Wakefield, Yorks. Consents to thirteen extensions of existing stations were also given and the total number of turbo-alternators involved was fifty-six, with an aggregate capacity of 3,275 MW. A 100 kW wind-driven generator in the Lleyn Peninsula, North Wales, was also the subject of a consent.

Of other consents issued by the Minister 7,415 covered the placing of overhead lines, 19 the adoption of protective multiple earthing for medium- and low-voltage systems, two multiple earthing of high-voltage systems and 69 changes of frequency or voltage.

Reports made to the Minister showed that 27 persons were killed (including 12 members of the public) and 315 injured (69 members of the public) as a result of accidents in connection with the works or circuits of the Electricity Boards. Included in these were accidents in which 31 members of the public were injured (seven fatally) when mobile elevators, cranes, etc., touched overhead lines; seven accidents (three fatal) due to members of the public climbing overhead line supports; and 35 manhole and similar roadway explosions involving injury to five members of the public. In addition reports were received of 64 fatal electrical accidents to consumers.

Notices were given and regulations prescribed in 27 cases where electric lines and works were erected or laid down without statutory authority.

Twenty-one new electricity meter designs and ten modifications of existing designs were approved during the period. In disputes relating to the accuracy of 16 meters 13 were found to be in proper order while three were not.

No directions were given by the Minister under the 1947 Act to the British Electricity Authority. So far as capital investment was concerned no changes were made in the agreed yearly programme of commissioning of new generating plant, which up to 1955 is to rise to a maximum of 1,550 MW, although there has had to be some curtailment of distribution work.

At the end of the previous year the Central Authority's borrowing powers amounted to £25 million. These were increased by stages to £140 million, valid up to 30th April, 1952. Methods of apportionment of payment in respect of rates were approved.

Other matters touched on in the report are the membership of the Central Authority Boards and Consultative Councils, conditions of employment and pension rights, compulsory purchase orders, etc.

BRITISH STANDARDS

THE revised edition of B.S. 469 dealing with electric lamps for railway signalling brings the form in which performance requirements are stated into line with that of other British Standards for electric filament lamps; it also includes lamps for up to and including 110 V lamps whereas the older editions dealt only with lamps for up to 25 V. Preferred types are indicated by heavy type in the tables and information is given about the effect of voltage variation on wattage, lumen output and life of lamps as well as about dimensions, insulation, filaments and marking. Test conditions for cap attachment, insulation and life are specified. Copies are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, Price 4s.

Thermocouple Reference Tables

These tables (B.S. 1826 for platinum/rhodium *v.* platinum and B.S. 1827 for nickel/aluminium *v.* nickel/chromium couples, price 7s 6d and 6s respectively) are for use in converting couple voltages into the equivalent measured temperatures and in defining the relation between impressed e.m.f. and scale reading for pyrometers which indicate temperature directly. Copies are obtainable from the B.S.I.

DEVELOPMENTS IN BRAZIL

Power and Industrial Schemes

From Our Rio Correspondent

ON the recommendation of the Brazil-United States Commission the World Bank has authorized a loan of U.S. $25 million to a State-owned enterprise in Rio Grande do Sul to finance imports of equipment for four hydro-electric and four thermal power stations, designed to raise the plant capacity by 137,200 kW. The loan, which will be used to purchase foreign currencies, is for 25 years, with interest and commission rates amounting to 4¾ per cent.

Projects Under Consideration

Eight other projects, calling for loans totalling about U.S. $60 million, have been approved by the Commission and now await a decision by the banks. Four of the proposed loans are to cover imports of power station equipment, namely: U.S. $7·7 million for the 60,000 kW station at the Salte Falls (see *Electrical Review*, 13th June, 1952): a representative of the World Bank was recently in S. Paulo in connection with this loan; U.S. $5·3 million for the 36,200 kW central station now being built by the Companhia Electrica do Alto Rio Grande at Ututinga to assist development of a rich mineral and manufacturing zone in Minas Geraes (hydraulic and electrical equipment will be supplied by the Westinghouse Electric International); U.S. $8·5 million to the Cia. Hydro-Electrica do Sao Francisco to install a third 60,000 kW generator; and U.S. $1·47 million to the Cia. Nacional de Electricidade, Catanduva.

Eleven other projects, involving loans amounting to U.S. $113 million, are being prepared for submission to Washington. Four relate to railway improvements, which include electrification works; one is for power station equipment in Matto Grosso and the others are for farm machinery, dredgers, port equipment and materials for the S. Paulo municipal transport system.

In August the Parana Government submitted plans for a hydro-electric station at Cotia. The coastal zone and Curityba, the capital, have developed rapidly in the last few years but further progress is retarded by inadequate power supplies. Installed capacity, public and private, amounts to only 35,000 kW, 5,000 kW short of requirements, although hydro-electric potential within the State is estimated at 4 million h.p. The Cotia station will satisfy immediate needs and supply power to electrify the Parana-Santa Catarina Railway, for which another loan has been requested.

The S. Paulo Light & Power Company has submitted to the Commission a project for a 160,000 kW thermal power station, which is urgently required to meet the heavy demand for power in the State.

Among other projects, not dependent on the Brazil-United States Commission, are the following: Rede Mineira de Viacao (Minas Geraes) invites tenders for the building of a 4,200 kW station at Oito Arrobas, in the State of Rio, to supply power for part of its railway system. The Sao Francisco Valley Commission has signed a contract with the Minas Geraes Government for supplementary works for the central station at Fecho do Funil (see *Electrical Review*, 1st June, 1951). A dam will be built on the Para River, near Carmo do Cajuru, to regulate the flow of water, raise the capacity of the Gafanhoto station and facilitate work on the main project.

Electricity and Transport in Manaos

A joint stock company has been organized by the Governments of Amazonas and the Federal Union to reform and exploit the light, power and tramway services of Manaos. The initial capital needed will be £2 million, of which £208,000 will be subscribed by the public, and the Bank of Brazil will furnish exchange cover to import the necessary electrical and tramway materials.

VIEWS on the NEWS

By REFLECTOR

IT is the custom for the chairman of the British Electricity Authority, supported by his deputy chairmen and principal officers, to meet Press representatives on the occasion of the publication of the Authority's annual report. It is of great interest and value to electrical journalists to note the trend and tone of the remarks of their lay colleagues. At the first three meetings comments were not on the whole friendly to the Authority, but at last Tuesday's gathering there seemed to me to be a complete change of attitude. The questions put were pointed, but not barbed, and the gathering was a very quiet one. It appears that the idea of nationalized electricity is now accepted and that the Authority's problems are better appreciated.

* * *

It was suggested by Mr. R. M. Wynne Edwards in the *Economist* recently that there was too much brickwork in modern power stations and that the simpler construction adopted for oil refineries would be more economical. Replying to this Mr. A. Trystan Edwards defends the British Electricity Authority. He contends that power stations are not comparable with oil refineries in view of the need for easy access for fire-fighting in the latter case. Mr. Trystan Edwards says:—

> "In insisting that all power stations erected under its auspices should have a decorous appearance, the British Electricity Authority in my opinion has shown itself to be an enlightened patron of the art of architecture and has done much to raise the standard of industrial building in this country."

Much depends on the situation and surroundings of the power station but generally I agree that the B.E.A. does well to erect stations of pleasing design.

* * *

One reason for the low consumption of electricity about which the East Midlands Consultative Council is concerned (says the *Nottingham Guardian*) is revealed by the complaint of a consumer that when he moved into a new house he was refused a slot meter. Other readers have similarly complained. I can appreciate this for it is not easy for poorer people to save up for a quarterly bill. As the Electricity Boards recoup themselves, by higher charges, for the extra costs attached to prepayment meters, I wonder what their objections to those meters are.

* * *

I am pleased to see that Mr. A. A. Heath, managing director of Permali, Ltd., and a member of the Gloucester and County Chamber of Commerce, protested recently against the attitude of the Chamber towards the Area Electricity Board. The particular point was the insistence by the Chamber that the cost of a local electricity service centre should be divulged, but Mr. Heath raised the general question of the Chamber's attitude towards electricity. He said that the B.E.A.M.A. was feeling great concern at what it considered to be anti-electricity propaganda and he welcomed any attempt by the electricity authorities to educate people through service centres in the right use of electricity. The president of the Chamber denied that they had an anti-electric bias and Mr. R. C. Brown (chairman of the committee dealing with the service centre question) confirmed this and (as reported by the Gloucester *Citizen*) later said that he would "now have a go at the Gas Board" for the way in which it spent public money.

* * *

One of the suggestions put forward at a recent meeting of the Worthing Coronation Committee was that the Downs should be floodlit. This, at first sight, appears to be quite a tall order, but the proposer qualified his suggestion by saying: "Perhaps not all of the Downs, but certain features of the Downs." If only a few acres were floodlit it would be quite a nice little job for a contractor.

A Mathematical Fancy

Energy Distribution Along the Time Dimension

By D. G. SANDEMAN, B.Sc., A.M.I.E.E.

DURING a lesson on "rates of change" a class of third year National Certificate students was asked: when we say that "time flies," or "time has a velocity" what do we imply? What other dimension do we employ to measure the passage of time? One student immediately suggested that "time has a rate of change with respect to life." There is a great deal to think about in this answer. There is a continuous transmutation of energy which is referred in some way to time. The following musings may entertain readers interested enough to pursue the matter a little further.

Let us illustrate our problem by considering radio activity, which takes place at a definite rate that cannot be hastened or retarded by ordinary shock or temperature variation; is subject to a decay, which may be very gradual or very swift, and follows the same law as that of temperature decay in a cooling body. So far as I am aware there is no theory to account for this phenomenon and the following remarks are offered in a very humble way as an attempt to bridge the gap.

Suppose that there is some other dimension which we can employ to measure the velocity of time. Let us call it χ for want of a better symbol. The velocity of time is then $\frac{dt}{d\chi}$ and acceleration of time $\frac{d^2t}{d\chi^2}$. Let us assume that energy is associated with the passage of mass through time; our atomic force is therefore $M\frac{d^2t}{d\chi^2}$ and the energy released along time is: $\int_{t_1}^{t_2} M\frac{d^2t}{d\chi^2}dt$ ....(1)

This is arrived at by analogy with ordinary dynamics (energy $= \int_{s_1}^{s_2} M\frac{d^2s}{dt^2}ds$).

Before condemning the idea outright let us see where it leads us and examine the results to see whether they are reasonable or not. One other assumption is necessary, an easier one; that the rate of energy dissipation is proportional to the total store of energy. This supposition is necessary to give the logarithmic decay observed in nature.

First it is necessary to obtain an expression for the total store of energy; writing (1) again:

$$\text{Energy} = \int M\frac{d^2t}{d\chi^2}dt$$

$$\text{Power} = M\frac{d^2t}{d\chi^2} \quad \ldots\ldots\ldots\ldots(2)$$

$\frac{d^2t}{d\chi^2}$ = ergs/sec given out by each gramme of the substance

= ergs/sec/gramme = p.

This equation furnishes a dimension for χ, as unit acceleration of time in C.G.S. units is obtained when one erg is released per second by one gramme of the substance. This is the second occasion upon which the impatient reader may wish to close the page. "How," he will ask, "can you observe different accelerations or velocities in time?" Why not? A velocity, or acceleration, has two factors: a numerator (time) and a denominator (χ). Time is a dimension which is immutable and it can be used as an absolute standard for referring one event to another, but the denominator χ, we shall see, is subject to variation. Let us crave a little further indulgence of the reader. We shall see what sort of a dimension χ is and how it can be measured.

From (1) total energy $= \int M\frac{d^2t}{d\chi^2}dt$

$$= \int M\frac{d^2t}{d\chi^2}\frac{dt}{d\chi}d\chi$$

$$= \tfrac{1}{2}M\left(\frac{dt}{d\chi}\right)^2 .(3)$$

This expression is similar to the well known kinetic energy formula $\frac{1}{2}MV^2$.

Let us now make use of the second of our assumptions, that the energy dissipation rate is proportional to the total stored energy:

$$-K\frac{M}{2}\left(\frac{dt}{d\chi}\right)^2 = M\frac{d^2t}{d\chi^2} \ldots\ldots \text{(from (2) and (3))}.$$

Therefore K is a fraction. Multiplying both sides by $\frac{dt}{d\chi}$ and integrating we obtain:

$$K\chi + C = \frac{2d\chi}{dt}$$

$$dt = \frac{2d\chi}{K\chi + C}$$

$$t + D = \frac{2}{K}\log(K\chi + C)$$

$$\chi = \frac{e^{\frac{K}{2}(t+D)} - C}{K} \quad \ldots\ldots(4).$$

In other words χ is itself a function of time. Let us proceed to examine this result to see what it implies. χ advances with time but at an exponential rate. The velocity of time $\frac{dt}{d\chi}$ therefore eventually becomes 0 when t is large, as can be shown in another way by differentiating (4):

$$\text{Thus } \frac{d\chi}{dt} = \frac{1}{K}\left\{e^{\frac{K}{2}(t+D)}\right\}\frac{K}{2} = \tfrac{1}{2}e^{\frac{K}{2}(t+D)} \quad \ldots\ldots\ldots(5)$$

$$\text{and } \frac{dt}{d\chi} = 2e^{-\frac{K}{2}(t+D)} \quad \ldots\ldots\ldots (6)$$

$$\frac{d^2t}{d\chi^2} = \left\{2\left(-\frac{K}{2}\right)e^{-\frac{K}{2}(t+D)}\right\}\frac{dt}{d\chi}$$

$$= -2Ke^{-K(t+D)} \quad \ldots\ldots(7)$$

When t is great both (6) and (7) vanish, but, when t = 0, the velocity of time at start of experiment (t = 0) is given by:

$$\left(\frac{dt}{d\chi}\right)_{(t=0)} = 2e^{-\frac{KD}{2}} \quad \text{(when } t=0) \ldots(8)$$

and acceleration of time at the same period is given by:

$$\frac{d^2t}{d\chi^2} = 2Ke^{KD} \quad \text{(when } t = 0) \quad \ldots(9)$$

In the case of all the energy being released at once (as an atomic explosion) the total energy per gramme =

$$\frac{p}{K} \text{ and } \frac{dt}{d\chi} = \sqrt{\frac{2p}{K}}$$

To investigate the constant K, let us look for a moment at (7):

$$\frac{d^2t}{d\chi^2} = -2Ke^{-K(T+D)}$$

If energy rate is known and the half-activity period then we are in a position to evaluate K. If t_1 is the present time and t_2 the time at which the dissipation of energy has fallen to half its present value then proceeding:

$$-2Ke^{-K(t_1+D)} = 2\times 2Ke^{-K(t_2+D)}$$

$$e^{-K(t_1+D)} = 2e^{-K(t_2+D)}$$

$$-K(t_1+D) = \log 2 - K(t_2+D)$$

$$t_2 = t_1 + \frac{\log 2}{K}$$

from which K may be calculated; for example, if $T_2 - T_1 = 1{,}600$ years then $K \cong 1{\cdot}35 \times 10^{-11}$.

Force and Power

A final point of interest is that the expression for force is identical with power—(1) and (2)—which means that the force of ordinary space dynamics, adequate as it is to produce energy along space, has a counterpart along time but in the shape of power. Atomic power is the force necessary to produce changes in energy level along the time dimension.

The idea may not be a very useful one, but it serves to explain and measure what is experienced by everybody: that the passage of time is not constant. Time appears to pass very quickly at the initiation of some project and eventually with the passage of years it will seem to stand still. It is a common experience to seem to judge time with great precision while asleep and yet be quite unable to gauge the passage of time during waking hours. This "fact" should be in accord with the theory, as both the velocity and acceleration of time would be greater during periods of greater energy conversion.

The author is Head of the Engineering Department at the Technical College, East Ham.

New Books

Electrical Communication Experiments. By H. R. Reed, T. C. G. Wagner and G. F. Corcoran. Pp. 458; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 54s in the United Kingdom.

This book will be welcomed by all who are responsible for developing laboratory courses in electrical communications or electronics. It contains a total of 60 experiments, each one described in detail with relevant theory and valuable practical information. The experiments are divided into four groups, namely, d.c. fundamentals, a.c. fundamentals, engineering electronics and radio communication. The earlier experiments are suitable for first-year students in electrical engineering. Later experiments cover the electronics and communications field very well except that wave-guides and antennas are omitted on account of the need for special apparatus. The material forms the laboratory work of certain courses in electrical engineering at the University of Maryland.

It is believed that there is no other book in English covering this field nearly so adequately. There is a useful introductory chapter dealing with the method of writing laboratory reports, and the aims of laboratory work. Uncertainties in measurement are also dealt with. The presentation is excellent, and the treatment beyond reproach, each experiment being treated as an engineering project. The book might well become a standard laboratory handbook.—L.C.W.

Automatic Feedback Control. By W. R. Ahrendt and J. F. Taplin. Pp. 412; figs. and index. McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Price 64s in the United Kingdom.

Yet another general textbook on automatic control systems must be assessed by asking whether it adds to or improves upon the several books now available. Actually only the second half of this volume is new, for the first half was published in a preliminary and poorly printed wartime edition under the title "Automatic Regulation" in 1946. The new and considerably extended version now published is printed and illustrated in a first-class manner.

This book fully justifies its appearance on several counts. It is noteworthy for the large numbers of examples given of the complete families of characteristics for control systems of various basic types. The practical examples chosen for discussion tend to be different from those of many of the available textbooks, the governing of internal combustion engines and pneumatic and hydraulic controls being given some prominence.

The theoretical treatment includes interesting and stimulating ideas, but adequate foundations are not laid for the mathematical methods used, and as a textbook for students it would need to be supplemented by the use of a systematic volume dealing with the relevant mathematics. The Laplace transform is introduced at the commencement rather as a matter of the application of arbitrary rules, though there is some interesting discussion of its properties later on.

Among the material added since the earlier edition is a chapter on non-linearity and discontinuity. This is somewhat elementary and does not advance this difficult part of the subject. The remaining new material is a useful account of a wide variety of control system elements and practical devices. A large collection of problems and exercises is given, with answers to the numerical problems.

The book is certainly a useful addition to the literature on control systems. It will be of value to teachers, and useful to students rather as a supplement to other books than as a primer. Designers and users of control systems will find it instructive and suggestive.—A.T.

Books Received

Electrical Engineering: Theory and Practice. By W. H. Erickson and N. H. Bryant. Pp. 515; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 48s in United Kingdom.

Practical Clock Repairing. By D. de Carle, F.B.H.I. Pp. 234; figs. 412; index. N.A.G. Press, Ltd., 226, Latymer Court, Hammersmith, London, W.6. Price 30s.

Power Plant Shortage

The Present Position as Viewed from the United States

By J. G. B. HAMILTON, B.Sc., A.M.I.E.E.

DURING a recent stay of ten months in the United States of America I had many opportunities of studying electrical conditions there and considering their relationship with the fact that, with a population of 150 million against 50 million in Great Britain, the U.S.A. in 1950 produced six times as much electrical energy and had five times the plant capacity.

In attempting to scale down this ratio two problems have to be tackled. The first is to install within a reasonably short time sufficient additional capacity to meet the demands under present restrictions on load growth, to establish a reserve of plant large enough to meet contingency "outages," and to replace inefficient plant now in operation although past its economic life. The later objective is to augment plant capacities further to meet an unrestricted load growth, perhaps "forced load growth" would be more descriptive because, as a country, we must increase the utilization of electricity, particularly in industry. Any other attitude would be to admit that this country is to be of little consequence in the industrial world of to-morrow.

Plant construction programmes in the United States, which are intended to meet only the normal system load growth, provide for nearly 20,000 MW to be installed during 1952 and 1953, whereas the maximum expectation for Great Britain during the same period is 2,900 MW.

Mere revision of the British programme, however, would not produce a single extra kilowatt above the targets set at present, unless the limitations which have determined these programmes are either removed or at least considerably eased. The main restriction is stated by the B.E.A. to be the limited amount of plant which the manufacturers are likely to be able to supply. The other factor, which threatens to be even more severe, is the possibility that rearmament may shortly force restrictions on capital expenditure.

At first sight no great expansion of the present programmes seems possible. Even if manufacturers could give us as much plant as we require, it seems extremely doubtful whether we could afford the huge additional capital investment involved. The reservation of factory capacities for power plant purely for installation in this country might increase our programmes by 50 per cent, but it would seriously lower income from exports and jeopardize our position in the world market for electrical equipment.

There is, however, ample room for cutting the cost per kW of new power stations. This is virtually the same in the two countries, although labour rates and salaries in the U.S.A. are nearly three times those prevailing here; most materials, too, are considerably more expensive. Since labour and materials comprise almost the whole cost of a new power station, a considerable increase in the new capacity which can be installed for any limited capital expenditure specified is thus obtainable in the United States. A large part of the responsibility for lowering costs must therefore rest with manufacturers, since about half of the cost of a station is incurred in the purchase of plant.

Large sums of money are spent to obtain a very small improvement in the continuity of supply, which power cuts are making into a myth. Would it not be better to reserve our limited manufacturing capacity for the production of plant for full operation rather than components for second line or even third line stand-by? The inherent reliability of electrical and mechanical components has increased considerably in

the last few decades, but the number of them held for stand-by duty has not increased correspondingly. This in effect constitutes a plea for simplification of design, such as by the unit arrangement of generating sets and by the use of single instead of duplicate busbars.

A reduction of stand-by components is not necessarily a threat to reliability of the plant as a whole, which is in fact usually improved by simplicity. The point may come where there is too much overlapping and complication in measures to protect plant from damage and operators from danger, but this point has not been reached yet.

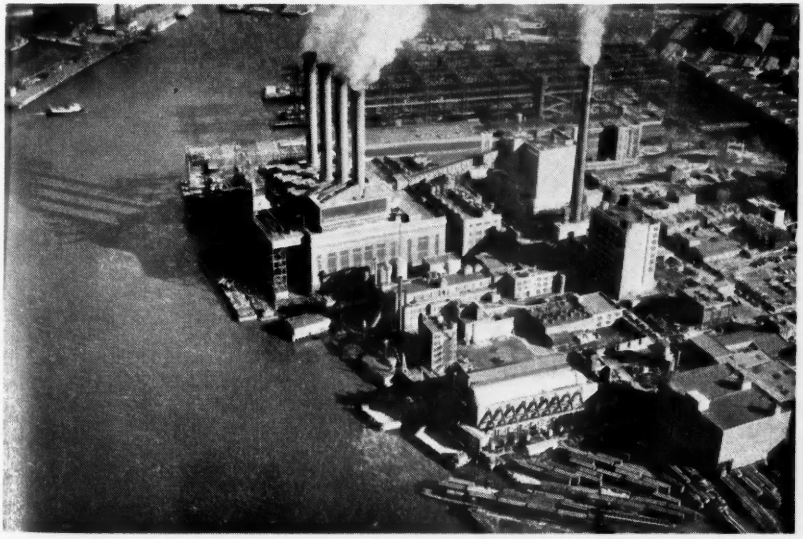
Any reduction in the standard of continuity is not a measure I would normally even care to mention. Before the present protracted crisis, it had been a matter of prestige in the industry to maintain it at its highest. But in the present circumstances, I consider that the consumer in industry and in the home, would more readily accept temporarily what would be a negligible risk of reduction in continuity of the supply, in order to shorten the period of power cutting and perhaps make available extra capital for additional new plant.

In view of the relatively low cost per kW installed in the United States a comparison between design and construction techniques there and here may provide some useful indications of ways in which we can attack our own problems. In the companies I visited continuity of supply to the public is regarded as of superlative importance, and their engineers appear to be justifiably proud of their records in this respect. At the same time, they seem to have more leisure to make a study of each detailed item of design, comparing alternative designs in cost and reliability, and to balance cost differentials against probability and consequence of failures. As a result, a less expensive design can often be accepted as a calculated risk. This application of probability as a law rather than as a theory appears to be justified by results. The close study of costs in detail at every stage is a very notable feature of design in the United States.

Set Ratings

A glance through the current construction programmes of the leading American utilities shows that their new sets are almost exclusively rated at between 125 MW and

Hudson Avenue power station (Consolidated Edison Co.) is the largest in the world. It contains 914 MW of generating plant and a boiler with an evaporative capacity of 1,450,000 lb/hr, with steam conditions of 1,350 lb/sq in and 1,000 deg F, also said to be the biggest yet built



200 MW and that the average is quickly climbing towards 200 MW, which leads to lower capital expenditure per kW. British programmes show the majority of sets to be of 30 and 60 MW, with only a few sets reaching 100 MW, the average size being about 50 MW for over 200 sets in the current five-year programme. This notable difference cannot fail to have a tremendous effect on almost every aspect from design and manufacture, through construction, to operation and maintenance.

A leading American manufacturer is increasing production of turbo-alternators six-fold within a few years. While this is partly because of extended factory facilities, it is also due very largely to the great increase in the average rating of the sets. In Britain, where manufacturing capacity for the home market is the main bottleneck, a similar increase in sizes would greatly help. Less material per kW is required in the manufacture of larger sets, a very cogent point in these days of material shortages. The total design work is also considerably reduced.

The engineering and draughting required for a set of 150–200 MW is little more than are required for one of 50 MW. Cutting down the number of projects entailed in any installation programme would enable the present force of engineers to look further into the questions of relative design and costs. The greater degree of specialization of the function of engineers thus made possible is very necessary in view of the ever-growing complexity of the modern power station. Larger set ratings would also economize labour and materials and reduce the construction time required per kW.

Virtually all the new American sets are to be of the unit type, operating independently of other sets in the same station. This leads to further savings in cost, owing to the omission of the interconnecting pipework and valves and systems of interlocks necessary on a steam header system.

Loss of a very large set due to breakdown without any warning should not be too difficult to cater for on an integrated system of the magnitude operated by the B.E.A., as no great difficulty is experienced on systems of very much smaller capacity in the United States. Quick starting methods for large sets are being studied

The 618 MW Waterside station of the Consolidated Edison Co.

intensively there, and considerably more will doubtless be known about this problem before it becomes critical in Britain. The reduction in operating personnel per kW achieved by the adoption of the larger unit justifies the use of automatic and central control systems which would be too expensive for the control of a greater number of smaller sets. This results in a second reduction in operating staff per kW.

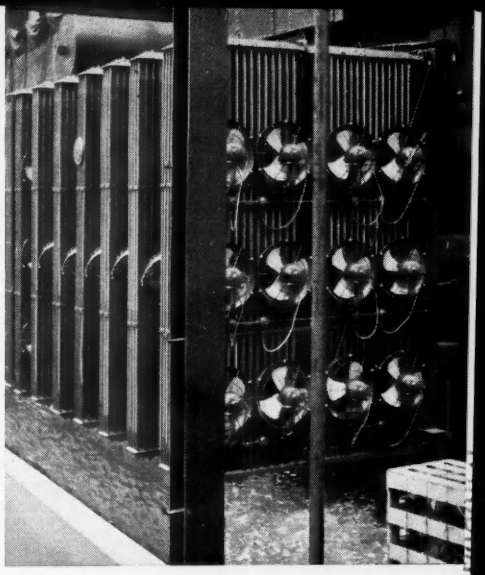
The overall efficiency of the very large set should be higher than that of the small set of similar design, as many of the auxiliary losses are virtually fixed and do not increase in proportion to rating. Heat rates as low as 9,000 B.Th.U./kWh are expected from sets now under construction by companies which I visited. The difference is partly due to the now widespread use of the reheat cycle in America and also to the better quality of coals used in the United States, which incidentally permits of smaller boilers (with higher availability) for the same rating.

Maintenance "outage" period is not very much influenced by the size of the unit, but the number of overhauls will be inversely proportional to the average unit size. With the smaller number of overhauls, it becomes feasible to use a roving overhaul crew serving all the stations in one area.

Because of these manifold advantages, we must overcome the difficulties of development and manufacture of large units with a war-time urgency. I do not advocate a leap into the unknown, such as the building of single-shaft 200 MW turbines running at 3,600 r.p.m. for inlet steam conditions of 2,000 lb/sq in and 1,100 deg F. Only time will tell whether or not this bold step by the Americans borders on rashness.

Although Great Britain cannot afford the luxury of such experiment, she may well follow closely behind the United States, making the most of the advantages of rating, temperatures, and pressures of the highest values which have been proved by American experience to be feasible and relatively trouble-free. I have been very much gratified and impressed by the free manner in which such valuable information has been passed on to me in my visits.

There may be expensive "teething troubles" before any considerable knowledge of operating such large sets is gained in the U.S.A., but I do not doubt that these will be quickly overcome and that units of even larger ratings will follow. These



One of the current methods of cooling transformers

ratings might suggest turbo-alternators of enormous proportions, but this is not so. Higher pressure turbines, using reheat or even double reheat cycles operating at 3,600 r.p.m. coupled to alternators, using the highly improved cooling of stator and rotor afforded by high pressure hydrogen flowing through hollow conductors, will enable the largest machines to be built with almost the same dimensions as those previously designed for half the rating.

The construction engineer's part in cutting costs lies mainly in the direction of arranging plant in such a way that building costs are minimized. Much of the alteration in the design of the main station buildings follows automatically upon the adoption of the unit set in which a single pulverized-fuel-fired boiler supplies steam to its associated turbo-alternator only. Such a boiler is tall and of relatively small cross-section compared with stoker-fired boilers and widens at the top to accommodate the increasing bulk of the superheater, reheater and economizer tubes. This shape allows much more room at the base of the boiler for the main auxiliaries—feed pumps, forced-draught fans and coal pulverizers, etc. Other main auxiliaries are accommodated in the turbine room and handled by the crane there, making the auxiliaries bay redundant.

Previously, the induced-draught fans,

grit arrestors and sometimes even the main stacks were customarily mounted above the boilers. By placing these outdoors at ground level, the volume of the boiler house building is considerably reduced, and the steel framework need be suitable only for the greatly reduced loadings. Consideration can be given profitably to the accommodation of the air preheaters out-of-doors too. Soot-blowing equipment, particularly of the retractable type currently used in most American boilers, should be replaced if possible by some type requiring less withdrawal space around the boiler, thus reducing boiler house dimensions still further.

In the turbine room, the greatest savings in building costs can be achieved by arranging the turbo-alternators longitudinally, assuming the use of single-shaft rather than cross-compound units. This minimizes the width of the turbine room, while the crane, roof and floor steelwork can be correspondingly lighter. Transverse arrangement of the turbines with several machines placed side by side at close centres is not so acceptable with the unit system, because the boiler centres have then to be farther apart as the critical dimension is the width occupied by the dust collectors. Dust collectors inserted in the flues have to be of sufficient cross-sectional area to allow the flue gas velocity to be reduced enough to cause deposition of the dust particles.

The five to six years which elapse here between the authorization of a project and its first commercial operation compare very unfavourably with the three years required in the United States. The longer period is due partly to the time required to obtain planning consents, partly to the greater manufacturing times because of export priority, and partly to the slower rate of making buildings available to receive the plant. Since manufacturers are sparing no efforts to reduce the delivery period of plant, in spite of the difficulty of expanding factory facilities under present economic conditions, progress in this direction is steady although slow.

Erecting work on site is still slow and comparatively unco-ordinated. It could be considerably improved by scheduling the work *in detail*, providing a larger supervisory force on site to secure adherence to that schedule and by the greatly increased use of mechanical and electrical tools, material handling, and earth-moving equipment.

Scheduling is particularly important and should start as soon as the set is authorized and should detail *week by week* the various items of the procedure (such as design conferences, drawings to be available, orders to be placed, materials lists to be completed) which must be in progress or finished in order to complete the programme by the appointed date.

American manufacturers generally supply the plant to site only, erection being carried out by separate specialist contractors. Erection contracts are arranged to cover as many items of plant as possible, so that a minimum number of contractors is on site during erection. This allows better co-ordination of the work and prevents congestion of the site and conflict between contractors working in the same area. This arrangement leads to a quicker and smoother flow of work and its application in Great Britain would be an advantage.

Ramsay Centenary

AN appeal has been launched by University College, London, for £100,000 with which to extend the laboratories wherein Sir William Ramsay worked from 1887 after seven years as professor of chemistry at Bristol University College. Ramsay was born on 2nd October, 1852, and died in 1916. His chief discoveries were the five rare atmospheric gases argon, helium, neon, krypton and xenon.

When opening an exhibition at the Science Museum, London, on 2nd October to mark the centenary of Ramsay's birth, Lord Woolton, Lord President of the Council, said that pure research had led to vast developments in our industrial life, but much of the work of British scientists had not been applied in this country because of our failure to train, and to absorb into our industrial life, chemical engineers and applied physicists—those practical scientists whom we had come to call "technologists." He said that if, through the application of scientific discoveries of the current age, we were to get the national benefit that fundamental scientists were offering to us, it would be necessary for us to alter our practices and to create, in this country, technological universities with the status and distinction that were given to existing universities: and, through them, to train a race of people who would see that the successors to the great scientist whom they honoured that day met with the encouragement, and the rewards, that were proper for the services they rendered to the community.

Assisted Power Schemes

Some Activities of the International Bank

By JOHN C. HANCOCK

"THIS order is being financed by the International Bank of Reconstruction and Development." These words endorsed on an order form are becoming more and more familiar to exporters and manufacturers—but behind this matter-of-fact phraseology lies a heartening story of international co-operation and growing economic development, especially in the field of electric power.

Hydro-electric and other schemes for electric power development form a large proportion of the Bank's loans since these are considered "good business"; in other words such undertakings can reasonably be relied upon to produce enough revenue to cover loan repayments. Among the sixty-eight projects financed by the I.B.R.D. in twenty-seven different countries—totalling $1,500 million—are the following:—

Loans for Development

$16,000,000 to Chilean corporations: $13,500,000 for hydro-electric developments and $2,500,000 for agricultural machinery.

$34,100,000 in two loans to Mexican Government agencies for electric power development. Of the total loan, $10 million was re-lent by the borrowers to the Mexican Light and Power Co., Ltd.

$75,000,000 to the Brazilian Traction, Light and Power Company, Ltd., for expansion of hydro-electric power facilities and telephone installations in Brazil.

$12,545,000 to the Lempa River Hydro-electric Commission, El Salvador, for the development of electric power resources on the Lempa River. (The first loan made in Central America.)

$18,500,000 to India for development of electric power resources in the Damodar River Valley. The loan will help finance construction of the Bokaro-Konar thermal power project which is the first stage of India's unified scheme to develop the resources of the Damodar Valley.

$26,000,000 to the Mexican Light and Power Co., Ltd. ($16,000,000 for four-year expansion programme of electric power generating, transmission and distribution facilities; $10,000,000 to refund loan made by the Bank in 1949 to the Comision Federal de Electricidad and Nacional Financiers and re-lent to "Mexlight").

$15,000,000 to the Sao Francisco Hydro-Electric Company, Brazil, for hydro-electric development on the Sao Francisco river.

$33,000,000 to Uruguay's General Administration of Electric Plants and State Telephones for expansion of power and telephone facilities.

$3,530,000 to the Central Hidroelectrica del Rio Anchicaya, Colombia, for the construction of hydro-electric plant.

$2,600,000 to the Central Hidroelectrica de Caldas, Ltd., Colombia, for the construction of a hydro-electric project.

$30,000,000 to the Electricity Supply Commission of South Africa for electric power projects.

$1,500,000 to Ethiopia for the rehabilitation and extension of the telephone and telegraph systems.

$2,450,000 to Iceland in European currencies (sterling, French francs, Danish kroner, Norwegian kroner) for purchasing equipment for expanding electric power capacity. The first loan consisted entirely of currencies other than U.S. dollars.

$2,400,000 to Colombia's Central Hidroelectrica del Rio Lebrija, a publicly-owned company, for a hydro-electric project to relieve the shortage in Bucaramanga, centre of the country's tobacco industry.

$29,700,000 to Mexico for electrical power development for industrial and agricultural uses.

$28,000,000 to Southern Rhodesia for expansion of power production and distribution facilities as part of a four-year development plan.

Apart from the schemes noted above, others ranging widely from the provision of modern agricultural equipment to the replacement of merchant fleets have benefited from the Bank's activities.

The amounts lent represent neither the extent nor the total cost of these projects. The Bank normally finances only the foreign exchange costs of imported equipment and services needed to complete projects; usually the larger part of the cost of any project is met by the borrower.

A common but erroneous impression is that the I.B.R.D. is a kind of unofficial American credit agency. True, in the first few years of its operations the Bank's lending activities were almost exclusively confined to loans in American dollars, since the United States was virtually the only country during that period which had any surplus resources or spare manufacturing capacity. However, the position is now being reversed. Of the loans sanctioned up to the end of this year—close on $500 million—roughly $460 million will be advanced in European currencies.

The United States, owing to its vast rearmament programme, is not now in a position to supply raw materials and capital equipment for civil needs on the same scale as before. The fact that loans are valued in terms of dollars may also give rise to the impression that they are advanced in dollars. This does not follow; the fact is that the Bank's "units of accounts" are always expressed in dollars. The Bank does not attach any "strings" to its loans and, subject to availability, borrowers are expected to procure their materials and equipment in the most economical and advantageous markets, just as when making any other commercial transaction.

Like the International Monetary Fund, the I.B.R.D. was established following the Bretton Woods Conference in 1944. It started its activities in June, 1946, and operates under Articles of Agreement signed by member governments. Generally, the Bank's lending operations conform to five main principles:—

1. Loans are made either to member governments or to governmental authorities or agencies, or private enterprises in the territories of member governments.
2. Loans must be for productive purposes. If, in the Bank's opinion, they cannot be justified on economic grounds they are excluded.
3. In making loans, the Bank must act prudently and pay due regard to the prospects of repayment. (Loans made to private agencies or development corporations are guaranteed by their respective governments.)
4. The Bank does not make loans which are obtainable in the private market on reasonable terms. Since the Bank is intended to promote private investment, and not to compete with it, business is not undertaken which private investors are willing to transact on a reasonable basis.
5. The use of loan proceeds is supervised. The Bank ensures that funds lent are used only for authorized purposes, with due attention to economy and efficiency.

To become a member of the I.B.R.D. a country must first become a member of the International Monetary Fund. The Bank's loan funds are obtained from shares subscribed by its member countries proportionately to their relative economic resources. Japan and Western Germany were admitted to membership in September, which means that the Bank is now able to make loans in 53 different currencies. Amortization of loans varies from 5 to 35 years.

Apart from making direct loans for development or reconstruction, one of the Bank's activities is that of advising and assisting member-countries to solve their economic problems. These services are undertaken not only in connection with pending or anticipated loan applications, but also in cases where a member country requests the Bank's general assistance independently of loan proposals. Services of this nature are of substantial assistance, particularly to countries whose economies are relatively under-developed.

In the early days of the Bank's operations recipient countries were reluctant to acknowledge that they were placing contracts on the strength of World Bank loans. Now, however, that countries are beginning to see the benefits which a loan from the I.B.R.D. confers on them an exporter who receives an order known to be financed by the Bank may be assured that once he has accepted it his Supply Department will assist him to obtain any materials which may be scarce. And having executed the order the manufacturer may be quite certain of getting his money and of knowing that an import licence in the country of destination will follow as a matter of course.

Sponsored Research

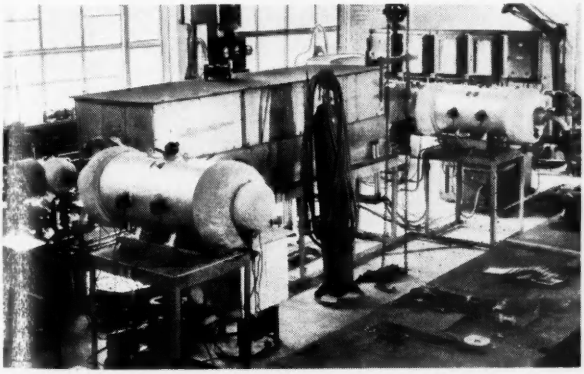
Work of the Fulmer Institute

Fulmer Research Institute main building

ABOUT 500 visitors, mainly industrialists and scientists, attended an "Open Day" at the Fulmer Research Institute, Stoke Poges, on 30th September, on the occasion of the fifth anniversary of the inauguration of the laboratories. It was also the occasion of some very high tributes to the founder of the Institute, the late Col. W. C. Devereux, C.B.E. For instance, in unveiling a memorial plaque to the founder, on behalf of Lord Hives, C.H., Sir Archibald Rowlands said that vision was one of Col. Devereux's great characteristics and his conception of the Institute had been justified by the results. Again, at lunch Mr. E. A. G. Liddiard, M.A., F.I.M., director of research, referred to the admiration and affection in which Col. Devereux was held and said that the finest memorial to any man was the successful continuation of his work and this was particularly true in the case of the Institute.

During a tour of the laboratories we learned that the total income of the Institute was over a quarter of a million pounds, 52 per cent of which came from Government Departments, 36·5 per cent from British industry and 11·5 per cent from Canada and the United States as direct dollar earnings. Coincident with the trebling of the revenue, the staff has been doubled, and a new building devoted largely to machine, heat treatment, casting and ceramics shops had now brought the total floor area of the buildings up to 22,500 sq ft. It is believed that the Fulmer Institute represents the first large-scale organization in this country to be engaged in carrying out sponsored industrial research.

Pilot plant for catalytic distillation of aluminium



While we saw no indication of any direct electrical investigations or work directly sponsored by the electrical industry, we got the impression, largely from the work relating to aluminium and the light alloys, that indirectly activities of great basic electrical interest were going on. For instance, the catalytic distillation of

aluminium is a process which may be used for purifying scrap or aluminium of commercial purity or for the extraction of aluminium from alloys produced by direct thermal reduction in an arc furnace.

The results obtained from exposing light alloy structures to various atmospheric conditions confirm that normally the rate of corrosion of aluminium base alloys tends to decrease with time and that, provided the original thickness is adequate, practically infinite life can be expected.

In connection with distortion and cracking in the combustion chambers of gas turbines we saw how the heating by radiation can be minimized by the application of low emissivity ceramic coating (reflection as distinct from absorption).

Strain-gauge measurements have recently been successfully applied by the Institute, in collaboration with Sir William Halcrow and Partners, to assess the relative movement between the old and new sections, i.e., main dam and backing slab, in connection with the heightening of the Mullardoch dam of the North of Scotland Hydro-Electric Board. Special strain-gauge units were inserted between the two sections and accurate movement figures were thereby obtained.

INDIAN ELECTRICAL IMPORTS

THE electrical import trade of India during the year 1951–52 recovered from the decline that had taken place in the preceding twelve months and showed an increase in value of nearly 25 per cent on 1950–51. Great Britain's share of the machinery trade was about 60 per cent, with the United States coming next; between them they accounted for three-quarters of this trade. In apparatus and appliances there was competition from Holland (radio goods), Hongkong (torch bulbs) and Switzerland (meters), while small quantities of wires and cables were imported from Japan. In contrast to most other lines, the cable business declined as a whole.

Values of the principal items with notes of increases and decreases on the preceding year are shown in the accompanying table.

Class of Goods	1951-52 Rs. (000)	Inc. or dec. on 1950-51 Rs. (000)
Fans and parts	5,51	+ 2,28
From United Kingdom	3,19	+ 57
„ *United States*	7	+ 4
Wires and cables, not telegraph or telephone, rubber insulated	51,96	— 71,88
From United Kingdom	40,89	— 68,41
„ *United States*	11	— 3,18
Ditto, insulations other than rubber	2,50,40	+ 53,77
From United Kingdom	2,45,04	+ 75,31
„ *United States*	99	— 19
Telegraph and telephone wires and cables	3,46	— 77,08
Telegraph and telephone instruments and apparatus	27,06*	— 76,91
Electric lamps	6,88	+ 61
From United Kingdom	2,75	+ 7
„ *United States*	1,75	— 54
Vacuum electric bulbs	48	— 19
From United Kingdom	30	+ 4
„ *United States*	1	— 6
Electric lamps for automobiles	32,05	+ 27,63
Electric bulbs for torches	27,02	+ 15,20
From Hongkong	4,65	+ 32
„ *United States*	11,93	+ 9,61
Other electric lamps	16,48	— 11,40
From United Kingdom	7,60	+ 5,34
„ *Hongkong*	1,27	— 19,08
Radio receivers, complete	52,64	+ 27,20
From United Kingdom	32,41	+ 15,24
„ *Holland*	8,55	+ 5,51
„ *United States*	1,89	+ 1,33
Radio valves	22,64	+ 8,97
From United Kingdom	14,41	+ 7,16
„ *Holland*	3,75	+ 34
„ *United States*	3,97	+ 96
Component parts of receivers, other than valves	1,16,62	+ 46,60
Batteries	24,23	+ 7,49
From United Kingdom	15,56	+ 2,08
„ *United States*	6,37	+ 3,17
Accumulators and parts	38,79	+ 14,48
From United Kingdom	34,19	+ 14,93
Electric condensers	5,08	+ 2,79
Electric bell apparatus	1,34	— 1,93
Electric lighting accessories and fittings	50,25	+ 29,45
From United Kingdom	38,45	+ 20,96
Meters	1,07,42	+ 43,25
From United Kingdom	60,15	+ 21,06
„ *Switzerland*	10,27	— 1,94
Other electrical instruments	23,84	+ 7,09
From United Kingdom	17,81	+ 9,43
Electro-medical including X-ray apparatus	36,29	+ 2,17
From United Kingdom	12,42	+ 9,05
„ *United States*	11,81	— 1,94
Switchboards other than telegraph or telephone	10,44*	— 4,59
Electrical porcelain ware	5,47	+ 2,90
Electrical goods and apparatus not enumerated	2,00,88	+ 70,23
From United Kingdom	1,10,43	+ 31,02
„ *United States*	37,12	+ 9,90
Control and switchgear	4,17,31	+ 52,90
Generators, alternators and dynamos	2,37,93	+ 82,44
Motors	1,11,74	— 15,90
Transformers	1,44,55	— 6,00
Turbo-generator sets	1,52,39	+ 87,11
Other electrical machinery	5,56,38	+2,49,99

* Mainly from United Kingdom.

Engineering in Europe

Survey of Current Literature

IT is impossible to design three-phase shunt-wound commutator motors of large output with a compensating voltage independent of load, because the no-load currents produced by the compensating voltage would become too large to be carried by the rotor winding. Also, the speed drop would for the same reason be excessive. A variable compensation of the reactance of the rotor circuit would thus seem to suggest itself and the choice of a variable capacitor for the purpose is fairly obvious.

However, the circuit becomes somewhat more complicated than the basic theoretical solution appears to indicate, because two more elements for current conversion are required, viz., a transformer and an induction regulator, the secondaries of which are in series and the primaries in parallel with the capacitor. This makes it possible to regulate the speed at resonance throughout the no-load range, resulting in optimum (minimum) values of rotor current, commutator size and number of brushes being achieved, with a corresponding reduction of temperature rise of rotor and commutator and suppression of sparking. It increases the overload capacity in the motoring and generating states, without excessive current rushes or speed drops, and renders reversing much easier. Complete theory given in "Three-Phase Shunt-Wound Commutator Motor with a Capacitor in its Circuit," by V. Klima, *Elektrotechnicky Obzor*, Vol. 41, No. 7, pp. 306–309, July, 1952, in Czech.

Utilization of Wind Power

Parallel operation of a wind power station with an existing public distribution system, while being the most efficient and desirable form of utilizing the energy of the wind, presents many difficulties which so far have not been overcome. These difficulties are easily understood when the discrepancy between a steady and reliable supply and the vagaries of incidence, gustiness and average speed of the wind is considered.

Long and systematic researches have been undertaken in all the countries where the utilization of wind power is a possible and necessary supplement of insufficient fuel resources. The paper is devoted to a promising attempt to overcome the difficulties in matching the characteristics of the windmill with those of the synchronous generator by the intermediary of a synchronous slip coupling, instead of having them rigidly coupled.

Of all imaginable methods of coupling two units as heterogeneous as synchronous generator and windmill, this is the one which theoretically as well as in practice must come nearest to an ideal solution. There is plenty of evidence available on the highly successful use of slip couplings in other cases of comparable difficulty and the reported experimental results—though the trials were too short to claim any finality for them—seem to indicate that the final solution of the problem might be achievable in this way. "Regulation of the Output of a Wind Power Station," by V. N. Andrianov and A. I. Pokataev, *Elektrichestvo*, No. 6, pp. 19–24, 1952, in Russian.

Overhead Line Construction

Two principal lines in Czechoslovakia, viz., the East-West line connecting Bohemia and Moravia and the North-South duplex line under erection in Moravia, are described in great detail and all the considerations preceding the acceptance of the final project are reported. The fact that tenders for towers and fittings were invited and received from all major European countries enabled interesting comparisons to be made between designs and production methods in these countries. In particular, experience gained in the erection and operation of such lines in Poland and the U.S.S.R. could be utilized.

The differences in the geological, geographical and climatic character of the three countries excluded any actual imitation of the examples, and it was due to these differences that, for instance, the Czech lines could be built with a more

favourable tower weight per km ratio than the Polish lines, but less favourably than in the U.S.S.R., whereas the relative volume of concrete foundations per km was better in Poland than in the two other countries. The reasons for these facts are also detailed. The tower types used in various countries and their comparative merits and demerits, relative costs of the various systems for equal performance, etc., are discussed and, likewise, those of insulators, clamps, and conductor and earth wire materials. Much space is devoted to the comparison of Polish and Czech methods of tower erection. " Design and Erection of 220 kV Overhead Lines," by A. Drażský, *Elektrotechnicky Obzor*, Vol. 41, No. 6, pp. 257–265, June, 1952, in Czech.

Circuit Breaker Testing

In a critical review of the development of synthetic circuit breaker testing since it was first proposed in 1936, the originator of the idea contrasts the method of testing several breaks in series with that where two separate sources of supply are used and shows that the latter method is from any possible viewpoint more conclusive and more favourable. The preferred variant of the method works with a series-connected source of current supply, the voltage of which is considerably higher than the arc voltage, and with repeated voltage pulses, these producing an arc of a duration equalling that of an arc produced by a full-power testing equipment.

The electric stress across the break may thus be made equal to the stress due to the actual full recovery voltage of the system simulated, and produced with the correct timing, provided the synchronizing problem is solved correctly by the design of the testing circuit. A good example of a circuit of this kind (the design of a German firm) and oscillograms proving its correct operation are shown and discussed. " Testing of H.V. Circuit Breakers and Fuses with Two Separate Supplies," by E. Marx, *E.T.Z.(A.)*, Vol. 73, pp. 417–420, 1st July, 1952, in German.

H.V. Line Interference Effects

A short theory of electrostatic and electromagnetic induction and interference effects between transmission and communication lines prefaces the discussion of the principal parameters and the characteristic current and voltage values, and ratios, used for defining severity of the effects. The difficulties of exact calculations of interference effects are pointed out and the method of complementary calculations and measurements is suggested as the only way promising trustworthy results. The main part of the paper is a report on extensive measurements on telephone lines near h.v. lines of the public supply and traction systems. The voltages on these lines were 16 kV and 55 kV ($16\frac{2}{3}$ c/s, single-phase), 110 kV single-phase, and 110 kV three-phase; in a second series of measurements, 220 kV (50 c/s). The tests were made under normal operating conditions (full-load, no-load, charging) and under artificially produced fault conditions with subsequent clearing. The inductive effects under fault conditions are considerable, but in general they remain below those predicted by theory. Protective measures are suggested, but their full effect can only be obtained by adapting them to the concrete case for which they are required. " Interference with, and Endangering of Communication Lines by Neighbouring H.V. Lines," by J. Tippl, *E. und M.*, Vol. 69, pp. 299–305, 1st July, 1952, in German.

Short-circuited Turn Detecion

All the known methods of detecting short-circuited turns in impulse tests on transformers were found to fail when chopped waves were employed. These methods belong in the main to two groups, viz., those based on the variation of the current to earth during the impulse test (Hagenguth, Wellauer, Rippon and Hickling, et al.), and those based on the variations of the voltage oscillations at the free end of the winding (Aeschliman and the authors). The authors now present a new method, based on the recording of the voltage oscillations of the secondary winding closed through an appropriate capacitance. This method suits both full-wave and chopped-wave test conditions equally well and enables turn short-circuits to be detected even if only one in 1,000 turns is short-circuited. " Indication of Turn Short-Circuits during Impulse Tests on Transformers," by B. Heller and A. Veverka, *Elektrotechnicky Obzor*, Vol. 43, No. 7, pp. 318–322, 1952, in Czech.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. – Editors, *Electrical Review*.

I.E.E. Sub-Centres

Biographies of the New Chairmen

WE conclude our series of biographies of officers of the Institution of Electrical Engineers for the 1952–53 session with notes and portraits of the chairmen of the Sub-Centres.

MR. H. CARPENTER (North Lancs.) is illuminations and public street lighting officer to the Blackpool Corporation. He received his practical training as a trainee with the Thornton Cleveleys electricity undertaking and later held the successive appointments of technical assistant (1931) and chief assistant (1933), being redesignated deputy electrical engineer and manager in 1938. In 1940 he was appointed as a temporary experimental officer on the staff of the Director of Scientific Research and Experiment, Admiralty, and from 1942 to 1945 he carried out duties under the Superintendent of Mine Design, H.M.S. *Vernon*, on anti-submarine protective devices. Upon release from war service Mr. Carpenter returned to Thornton Cleveleys and in December, 1945, was appointed chief electrical engineer and manager of the undertaking.

After nationalization he was appointed executive officer at Thornton Cleveleys and in 1948 he became domestic and commercial development engineer, No. 4 Sub-Area, North Western Electricity Board, with headquarters at Preston. In January, 1950, he took up his present position at Blackpool. Mr. Carpenter is a member of the Association of Public Lighting Engineers (at present a serving member of the Council) and a member of the Illuminating Engineering Society.

MR. J. H. PIRIE, B.Sc. (North Staffordshire) has been assistant chief engineer with Taylor, Tunnicliff & Co., Ltd., since 1945, having previously spent sixteen years with W. T. Glover & Co., Ltd., as technical engineer, during which period he was intimately connected with the development of high voltage gas-filled cables. Mr. Pirie was educated at St. Andrew's University and received his technical training with the Metropolitan-Vickers Electrical Co., Ltd. In 1948 he presented a paper on the application of semi-conductive glaze for porcelain insulators at the C.I.G.R.E. in Paris.

MR. W. S. STEEL, B.Sc.(Eng.) (Rugby) is commercial director of the British Thomson-Houston Co., Ltd. He was born and educated in South Africa, graduating in mechanical and electrical engineering at the Witwatersrand University. He subsequently joined the B.T.H. Co. as a student apprentice at Rugby and later became an assistant in the A.C. Engineering Department. This was followed by appointments in the Supply Department, which afterwards became the Industrial Sales Department.

In 1937, Mr. Steel went to South Africa as engineering representative of the company. Returning to this country in 1940 he held technical appointments in the Ministry of Labour & National Service for the next two years, afterwards becoming regional controller, Ministry of Supply, in Wales. In September, 1943, he returned to the B.T.H. Co. to take over Admiralty work in the Marine Department, and was appointed manager of that department in 1944. Mr. Steel became manager, home sales, in 1946; he was elected a director of the British Thomson-Houston Export Co.,

Mr. H. Carpenter

Mr. J. H. Pirie

Mr. W. S. Steel

Mr. L. B. Perkins

Mr. C. H. A. Collyns

Mr. J. S. Hastie

Ltd., in 1948, and of the B.T.H. Co. in 1950. He was a member of the I.E.E. Sub-Committee No. 2, dealing with a.c. installations, and of the Committee on Regulations for the Electrical Equipment of Ships.

Mr. L. B. Perkins (North Scotland) was educated at Bradford Grammar School and Bradford Technical College. After spending six years with the Bradford Corporation Electricity Department, he moved to Liverpool, where, in ten years he had varying responsibilities in the consumers' department. Mr. Perkins went to Aberdeen in 1946 as consumers' engineer, and is now commercial engineer for the Aberdeen Area of the North of Scotland Hydro-Electric Board.

Mr. C. H. A. Collyns (S.E. Scotland) was educated at the Royal High School, Edinburgh. He served with the R.F.C. in the 1914–18 war, later graduated in electrical engineering at Heriot-Watt College, Edinburgh, and joined the staff of the Musselburgh & District Electric Light & Traction Co. He was appointed assistant engineer with the Lothians Electric Power Co. in 1924 and held the posts of overhead construction engineer, substation engineer and personal assistant to the general manager. He was appointed general manager of the Lothians and Musselburgh companies in 1944. On nationalization, Mr. Collyns was appointed manager, Fife Sub-Area, South East Scotland Electricity Board.

Mr. J. S. Hastie, B.Sc.(Eng.), Mem. A.I.E.E. (South West Scotland) is a director of Scottish Cables, Ltd. His technical education was received at Glasgow University, where he graduated in electrical engineering in 1926. He served a "sandwich" apprenticeship with Fraser & Borthwick, Ltd., Glasgow, and in 1928 was appointed chief technical assistant to Enfield Cable Works, Ltd., Brimsdown, where he was mainly concerned with research and the development of high voltage cables. He was appointed chief cable technician to Johnson & Phillips, Ltd., London, in 1933, and three years later also manager of the Condenser Department. Mr. Hastie was appointed technical manager of Scottish Cables, Ltd., Renfrew, in 1937, and in 1945 was elected to the board of the company.

Mr. F. Seddon (Sheffield) is the deputy engineer of No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board. He was educated at Wigan Mining & Technical College, and received his training with the Hutton Colliery Co., and the Metropolitan-Vickers Electrical Co., Ltd. He held the successive positions of test engineer, Shropshire, Worcs. & Staffs. Electric Power Co., meter and test superintendent, Walsall Corporation Electricity Department, and meter superintendent, Sheffield Corporation Electricity Department, before taking up his present appointment. In 1949–50 he was president of the Electrical Power Engineers' Association and chairman of the National Joint Board for the Electricity Supply Industry. He has been a member of the National Joint Advisory Council for the Electricity Supply Industry since 1949, and was vice-chairman for 1951 of the Efficiency and Safety, Health and Welfare Committees of the Council.

Mr. R. H. Cotton (South Western) is chief engineer, Torridge Vale Dairies (Devon), Ltd., Torrington. He received his engineering training with Robinson & Hands,

Mr. F. Seddon

Mr. R. H. Cotton

Birmingham, with an interval for service in the Royal Navy (1918–1919). His technical education was obtained at Aston Technical College and the Central Technical College, Birmingham. Before taking up his present position he was associated with the Tube Investments group of companies, being in turn inspection engineer with Tubes, Ltd., Aston, Birmingham, and service engineer with Tubes Equipment, Oldbury, Birmingham.

COL. J. R. SUTCLIFFE (Tees-Side) was educated at Bradford Grammar School, and in 1919 joined the English Electric Co., at Phœnix Works, Thornbury, as an engineering apprentice, later taking a full-time course in electrical engineering at the Bradford Technical College. He entered the Post Office service in 1924 and held various appointments in Leeds, Oxford and Edinburgh. He was appointed to his present position of telephone manager, Middlesbrough Telephone Area, in 1948.

He was commissioned in November, 1929, in the Regular Army Reserve of Officers of the Royal Corps of Signals, and on the outbreak of war was a company commander with the 3rd Corps Signals. He was in the evacuation of Dunkirk, and later served as a company commander with the Signal Regiment in the Western Desert. He was subsequently promoted lt.-colonel, and in 1943 was appointed chief signal officer with the rank of full colonel. He returned to the United Kingdom in 1944 to join the planning staff for European invasion, and later served as chief signal officer, Air Formation Signals, operating from the Normandy beaches through Belgium and Holland into Germany. Col. Sutcliffe was awarded the O.B.E. in recognition of gallant and distinguished services in the Middle East during the period May to October, 1942.

MR. D. L. J. POWELL (West Wales (Swansea)) was educated at the Ystalyfera County School and the University College, Swansea, where he gained the B.Sc. degree in electrical engineering in 1943. He then joined the British Thomson-Houston Co., Ltd., at Rugby as a student apprentice and in 1946 was transferred to the Transformer Engineering Department as design engineer engaged on tap changing equipment and transformer substations. In 1949 he was appointed technical assistant to the area electrical engineer, No. 1 Area, South Western Division, National Coal Board,

Col. J. R. Sutcliffe

Mr. D. L. J. Powell

and in January, 1951, became technical assistant to the chief engineer, No. 9 Area of the same Division. During his stay at Rugby he initiated the formation of the Rugby Students' Section of the I.E.E., becoming its first hon. secretary and student representative on the newly formed Sub-Centre Committee. He served as chairman of the Students' Section in 1948–49.

Research in Universities

BRIEF details of research being done at universities and colleges in the United Kingdom in all branches of science and technology, including agriculture and medicine, are given in "Scientific Research in British Universities 1951–52," published for the D.S.I.R. by H.M. Stationery Office, price 8s.

The list was originally prepared for an Empire scientific conference in 1946 and was later taken over by the British Council. It was intended for the Council's use only, but there were so many inquiries and requests for copies that it was obvious that there was a much greater demand. The D.S.I.R. has arranged to sponsor its publication in future. The British Council will continue to collect the material.

Details of the research work are arranged according to university. They include the names of the staff working on the problem and enough description to indicate the scope of the research. The names are indexed so that it is possible to find out where a particular person is and what he is doing. It is hoped that the list will now become an annual publication.

Modern Electrical Contracting

This book, by H. R. Taunton, A.M.I.E.E., is a practical guide to the organization and operation of an electrical contracting business. It is obtainable, price 10s 6d (postage 5d) from all booksellers or the Publishing Dept., Dorset House, Stamford Street, London, S.E.1

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Minister of Fuel and Power has appointed the following as chairmen of Electricity Consultative Councils. The names of the previous chairmen are shown in parentheses :—Midlands, **Mr. R. M. Barrow** (Ald. H. Leason). South Eastern, **Comdr. D. S. E. Thompson,** R.N. (Mr. M. A. Bulloch). North Western, **Ald. F. Kenyon** (Ald. Wright Robinson). South Wales, **Mr. C. L. Hilton** (Mr. A. E. Gough). South West Scotland, **Councillor J. D. Kelly** (Mr. A. B. Mackay). South Western, **Lady Carew Pole** (Ald. H. J. Perry).

Sir Noel Ashbridge, B.Sc., M.I.C.E., M.I.E.E., F.K.C., F.I.R.E., who retired from the position of director of technical services, B.B.C. in July last, has joined the boards of Marconi's Wireless Telegraph Co., Ltd., the Marconi International Marine Communication Co., Ltd., Marconi Instruments, Ltd., and the English Electric Valve Co., Ltd.

Sir Noel Ashbridge

Mr. J. T. Rymer has resigned from the position of managing director of Mirrlees, Bickerton & Day, Ltd., and as a member of the Brush Aboe group. **Mr. C. F. Barnard,** assistant managing director, has been appointed general manager of Mirrlees, Bickerton & Day. He will remain a member of the Mirrlees board and be responsible for the future management of that undertaking.

Following a decision to expand and reorganize the Aeronautical Division of Marconi's Wireless Telegraph Co., Ltd., into three distinct sections—technical, sales and contracts, **Mr. B. J. O'Kane,** Ph.D., B.Eng., A.M.I.E.E., has been appointed chief air radio engineer. A native of Wallasey, Dr. O'Kane graduated as Bachelor of Engineering (first class honours) at Liverpool University, and two years later was awarded the degree of Doctor of Philosophy by the same University. From 1935 until 1941 he worked for the General Electric Co., Ltd., at its research laboratories. In 1941 he was seconded to the Telecommunications Research Establishment at Malvern, where he remained throughout the war, and later returned to the G.E.C. Since 1947 he has been chief engineer of International Aeradio, Ltd. **Mr. R. R. Stanford-Tuck,** D.S.O., D.F.C., who joined the company in 1949, is now appointed sales manager of the Division, and **Mr. F. Wheeler,** who has been with the company since 1918, is appointed contracts manager.

Mr. F. S. Johnson has resigned from the board of the Ever Ready Co. (Great Britain), Ltd.

Mr. H. C. Silver, M.I.E.E., who has been with the Electrical Research Association as technical secretary since its inception thirty-two years ago, retired on 30th September, but is being retained as E.R.A. representative on a number of B.S.I. Committees. A presentation of a portable wireless set was made to him by the staff. Mr. Silver has been in the electrical industry for fifty years, including service on the staff of Faraday House and the B.S.I.

The British Broadcasting Corporation announces that **Mr. M. T. Tudsbery,** C.B.E., M.I.C.E., the civil engineer, retired from the established staff of the Corporation on 4th October. He is being retained temporarily as consulting civil engineer. Mr. Tudsbery joined the B.B.C. in January, 1926, as the Corporation's first civil engineer.

The Lord President of the Council has appointed **Sir Wallace Akers,** C.B.E., F.R.I.C., and **Sir Philip Johnson** to be members of the Advisory Council for Scientific and Industrial Research. Sir Wallace Akers is a director of Imperial Chemical Industries, Ltd., and Sir Philip Johnson is a director of Hawthorn Leslie & Co., Ltd., and chairman of the Parsons and Marine Engineering Turbine Research and Development Association. **Professor P. I. Dee** retired from the Council on 30th September, on completion of his term of office, and **Sir Hugh Warren** has resigned his membership of the Council because of the pressure of other duties.

For their eighteenth production the **Babcock & Wilcox Staff Dramatic Association** chose "And No Birds Sing," by Jenny Laird and John Fernald. It was put on at King George's Hall, London, W.C.1 on

Thursday and Friday last week. The play revolves round a woman doctor—Elizabeth Payling—a part admirably portrayed by Joan Harsant. She, with her ward Pauline (June Bard) and a protégée Susan Catch (Pat Bayliss), present a variety of feminine problems which, with the help of a few males, particularly George Shilling (John Sarre), are satisfactorily solved. The rest of the company, all of whom did well, were A. Edmund Billings, Millicent Pluck, Phillip Geis, Simone Millington, Robert Adamson, Arthur Halls and Bryden Walker. The producer was Ralph Figue. Mr. W. Lionel Fraser, C.M.G., chairman of Babcock & Wilcox, Ltd., was in the first-night audience.

The General Electric Co., Ltd., announces the appointment of **Mr. W. G. Thompson,** Ph.D., as manager of the company's Witton Laboratories, formerly known as the Witton Development Laboratory. Dr. Thompson joined the G.E.C. Research Laboratories at Wembley in 1933. He remained there until 1937 when he was appointed assistant manager of the new Rectifier Works at Witton, a position which he has held for the past fifteen years. Dr. Thompson is a member of the Institution of Electrical Engineers and was chairman of the South Midland Centre in 1948.

Dr. W. G. Thompson

Contactor Switchgear, Ltd., has appointed **Mr. H. J. C. Earp,** A.I.E.E., Midland branch manager and **Mr. W. R. Hastings,** A.M.I.E.E., assistant sales manager to the company.

The annual ladies' night of the **Electrical Trades' Commercial Travellers' Association** was held on Friday last at the Café Royal, London, and was attended by 250 members and friends with their ladies. Once again the function was a great success. Brief speeches were made by Mr. F. N. Woods, who proposed the toast of the president, Mr. C. L. Elvy, who proposed the toast of the ladies, and Mrs. Watson, who responded on behalf of the ladies. Mr. W. H. Williams responded to the toast of the president, and Mr. A. Watson replied to the toast of the chairman proposed by Mr. L. A. Fickling.

A group at the Electrical Commercial Travellers' ladies' night. Left to right: Sir John Dalton, Mr. C. L. Elvy, Mr. L. A. Fickling, Mr. A. Watson (chairman), Mr. W. H. Williams (president) and Mr. N. V. Everton

Mr. F. Finigan, business manager of W. T. Glover & Co., Ltd., has retired after forty years' service with the company. He has been presented by Mr. R. M. Fairfield, director and general manager, on behalf of the staff, with a cheque as a token of their appreciation and good wishes for his future health and prosperity. Before his appointment as business manager in 1950, Mr. Finigan was joint sales manager of the company, which position he occupied for twenty-five years. He has been closely associated with the activities of the Cable Makers' Association since 1920.

Mr. C. T. M. Bagnall, publicity manager, English Electric Co., Ltd., and **Mr. S. H. Pryor,** publicity manager, Igranic Electric Co., Ltd., have been appointed members of the B.E.A.M.A. Publicity Committee.

An enjoyable evening was spent by about 500 people at Wembley Town Hall on 2nd October, when the **British Thomson-Houston (Willesden) Social & Athletic Club** held its annual ball. Mrs. Steel, wife of Mr. W. S. Steel, a director of the company, distributed the prizes after which Miss Sheila King, a member of the club, presented Mrs. Steel with a bouquet of chrysanthemums. In a brief speech Mr. P. E. Gaze, switchgear sales manager, thanked the committee for organizing the function. Dancing continued to the music of Chris. Stone and his orchestra and there were several spot prizes.

The annual **G.E.C.** golf meeting was held on 20th September at the Sonning Golf Club and was attended by fifty-eight competitors. The main event, the Hugo Hirst trophy, was won by Mr. A. Bailey of the Reliance Telephone Co., Ltd., Manchester, with Mr. G. L. Bishop of Pirelli-General Cable Works, Southampton, as runner up. The Veterans' Cup was won by Mr. E. G. Taylor (Manchester). Mr. Leslie Gamage, vice-chairman and joint managing director of the company, won the Australian Cup for senior veterans and, in partnership

with Mr. F. Winstanley, also won the Greensome Stableford competition. The morning medal competition was won by Mr. T. Ellis (head office), and the Robinson Rhodesia Tankard for the best scratch score by Mr. H. Pugh (London Sales). The Hon. Mrs. Leslie Gamage presented the prizes.

During the evening dinner, held in the Club House under the chairmanship of Mr. W. J. Bird, a presentation was made to Mr. Frank Farthing in recognition of his work in organizing G.E.C. golf events. Among competitors from overseas were Mr. A. Phillips (South Africa), who won a special prize presented by Mr. A. Silberman, Mr. E. C. Norris (British West Indies), Mr. C. Shaw (India) and Mr. A. E. Robinson (South Africa).

There were six cup events at the seventeenth annual gala of the **G.E.C. Swimming Club**, held on 24th September at the Marshall Street, London, Baths. These comprised the Lady Hirst Challenge Cup for ladies' diving, which was retained by the Research team (D. Stewart and I. Dale); the Magnet Club Veterans' Challenge Cup for the two lengths veterans' race won by Mr. Wentworth; the Mrs. Leslie Gamage Challenge Cup for the ladies' relay race, won by the Research team (D. Stewart, I. Dale, M. Carr and P. Barnes); the Leslie Gamage Challenge Cup for the men's relay race, won by the Head Office (D. G. Allen, P. Cotton, G. D. Jones-Thomas and R. Morgan); the Dennis Lavaraek Challenge Cup for men's diving, won by the Head Office (G. D. Jones-Thomas and A. Metcalfe); and the Sir Hugo Hirst Challenge Cup for the winner of the men's seven lengths race, won by A. Pengelly. The Club president, the Hon. Mrs. Leslie Gamage, presented the prizes.

To celebrate the winning by Burton employees of the **East Midlands Electricity Board** of the Area Cricket League championship this season, seventy attended the third annual dinner in the canteen, Horninglow Street, Burton. Those present included Messrs. C. R. King (chairman of the Board), A. Hardy (Sub-Area engineer, Derby and Burton), F. H. Pooles (Derby and Burton Sub-Area manager) and F. Overstall (manager, Burton district).

Mr. I. H. Hedley informs us that he has resigned from the Denis Ferranti Co., Ltd., and has relinquished his seat on the board.

Mr. A. P. Good, on medical advice, has relinquished his responsibilities as managing director of the Brush Electrical Engineering Co., Ltd. He will remain a director and deputy chairman of the company and continue to take an active interest in its affairs. **Mr. Miles Beevor,** who has been deputy managing director since early last year, succeeds Mr. Good as managing director. **Mr. Ian T. Morrow,** financial director, becomes deputy managing director.

OBITUARY

Mr. H. P. Wells, who died on 22nd September, at the age of sixty-four, joined the head office staff of the General Electric Co., Ltd., in 1910, and in 1917 was appointed secretary. At the end of 1920 he resigned as secretary in order to take up the position of general manager of the newly formed Telephone Works at Coventry, a position which he held until his retirement in 1945. Mr. Wells was for many years a member of the management board of the Coventry and District Engineering Employers' Association, and was also a member of the negotiating committee for women's wages of the Engineering and Allied Employers' National Federation.

Sir Archibald McKinstry.—The death occurred this week of Sir Archibald McKinstry, D.Sc., M.I.Mech.E., M.I.E.E., vice-chairman of the Metal Box Co., Ltd., and until 1951, deputy chairman and managing director of Babcock & Wilcox, Ltd. Sir Archibald was born in 1877 and was educated at Queen's College, Belfast. He joined the British Westinghouse Co. in 1902 and was connected with that company, and the Metropolitan-Vickers Electrical Co., Ltd. (its successor) and M.V. subsidiaries, up to 1930. He then occupied positions in Australia and New Zealand for some years, including that of Electricity Commissioner, Victoria. He was a director of the British Broadcasting Company from 1922 to 1927. Later he was very active in connection with various Government and other committees and commissions.

Dr. F. C. Lea.—The death occurred this week of Dr. F. C. Lea, at the age of eighty-one. Formerly Dean of the Faculty of Engineering at Sheffield University, he left in 1936 to join the board of Edgar Allen & Co., Ltd., retiring in 1950. During the 1914-18 war Dr. Lea was particularly interested in research into materials for aircraft and had much to do with the development of all-metal aeroplanes, for which work he was awarded the O.B.E. He was the author of several standard books on hydraulics and of numerous technical papers to important scientific and technical institutions, and had been president of Section G (Engineering) of the British Association and a member of various Government research committees.

The death occurred on 29th September of **Mr. Percy Harry Rolfe,** who retired from the British Thomson-Houston Company in 1948, after thirty-eight years' service, the last twenty-five of which were spent in the Publicity Department.

Mr. George F. D. Campbell, chairman of Campbell & Isherwood, Ltd., which he founded in 1896, died at Keswick last week

Machine Tool Control Gear

Need for Proper Accommodation

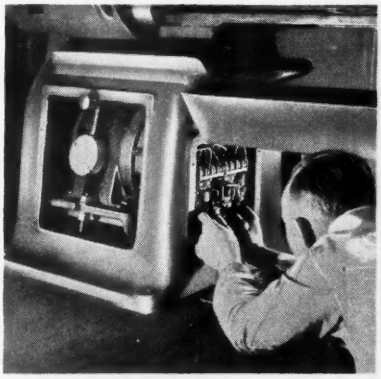
By J. O. KNOWLES, M.A., M.I.E.E., M.I.Prod.E.*

LOOKING round the stands at the Machine Tool Exhibition at Olympia† with the specialized eye of a control gear manufacturer, one cannot help commenting on the variety of positions in, on and around the machines where the motor control gear is mounted—or hidden. It is a very real problem to find the "right" place.

As the uses of electric drives by main and auxiliary motors have extended and have required the controls to include positioning, speed change, braking and so on, increased space has been needed to house the necessary contactors, relays, timing devices and other switches. The actual manual controls—push buttons and lever switches—can be disposed without too much difficulty, being small units which can be (and must be) placed where they can be easily reached. No designer really grudges time or thought in the design stage on the disposition and housing of these small operating units. The contactors and other "mysteries" which the control gear maker finds it necessary to provide to fulfil all the functions and operations required by the machine designer are difficult to blend into the machine outline. The idea of "building-in" the control gear so that the machine is a self-contained unit, and of pleasing appearance, has become so fashionable that it is time to see whether the prevailing fashion is right.

No machine tool maker wishes to increase the floor area occupied by his machines—certainly not for the sake of the control gear—even though he may have to take up more floor area for some good reason. Also the customer, or the customer's foreman, likes to see over at least the smaller machines which inexperienced operators may be expected to handle—and the fewer columns and switch boxes large enough to hide the human form the better in any shop. Where then can the control gear be put? On lathes and similar machines, for instance, it is becoming increasingly common to house the control gear in one of the pedestals, or if too bulky for that arrangement, in a position below the drip tray, either at the end of the lathe or in front of or behind the machine within a few inches of the floor. There is much to be said for such a position. It is tidy, it does not interfere with access to the mechanical movements of the machine, it enables the wiring to be run through the bed to the motor terminal or junction boxes, and to the push buttons, limit switches and any other electrical items (usually attached to the main structure of the machine) so that the wiring can be laid in at an early stage of assembly before the addition of other parts of the machine makes access difficult.

It is almost a compliment to the control gear maker on the reliability of his product to make access for maintenance difficult,



Example of unsafe condition of American equipment not conforming with U.S. electrical standards

* Chairman and Managing Director, Brookhirst Switchgear, Ltd.

† The Exhibition closed on 4th October.

but those who have tried to service control gear inside a cavity so low that one must lie on the floor and use one's arms only from the elbows, do not appreciate this compliment. It is better if control gear, when placed so low, can be swung out on a door, or at least accessibly housed in a deeply dished cover, the removal of which gives some view of the contacts when the electrician is sitting on the floor or on a low box, the box being at least a safeguard against being nudged by a passing floor truck. It is not easy to see terminal numbering on a terminal block near floor level when looking at the numbers from a sitting position, but it can be done. One can at least when sitting down jerk one's head backwards if, when testing out the job with "covers off and juice on," there is a sudden "short" due to a wrong connection or incorrect operation. It is not possible to make this instinctive movement when lying on the floor.

On simple machines, there is a lot to be said for plugging in units of control gear, so that they can be removed and replaced like a fuse if trouble occurs. It is not, however, on the simplest of control gear that trouble occurs—assuming in the first place a reliable make and an adequate size of control gear for the duty expected of it. It is in a combination of units with cross-interlocks, auxiliary switches, quick-acting relays and perhaps "split-second" timing that trouble, or at least maintenance attention, may be expected at some time—and the cost of providing connection plugs increases rapidly with the number of terminals to be disconnected, at least if adequate electrical clearance is to be provided between plug sockets.

Varied Practice

The above remarks emphasize the need to consider control gear positioning. At the recent exhibition almost every possible form of mounting of control gear was displayed, from a simple starter on a pipe standard near the machine, through all varieties of enclosure in the bed, to boxes supported on heavy brackets well outside the machine contour, the latter obviously with an eye on the American market and with knowledge of the insistence of many American buyers on the mounting of control gear well above floor level and in an accessible position, the insistence being all the stronger among purchasers who work two or three shifts in mass production factories. There is no general solution of this problem. On machines which have a fairly wide column, from milling machines to planers, the solution is easier than on lathes or grinding machines. On a column, the control gear can be semi-sunk, covered with a deep cover, or opened out on a hinged door, all without spoiling the clean lines of the column or machine. A study of some British and American machines will show that appearance and accessibility are not always an impossible combination.

More Space Needed

It is often less easy to replace coils or contacts in an American unit of control gear without removing the whole unit from the job, but this is compensated for by making the unit as a whole easily removable and by allowing more space round each unit. No doubt both American and British makers of control gear would welcome more space for them to do justice to the mounting and connecting up of their units. The old demand for smaller units has been reasonably satisfied—in fact there are American specifications which insist on NEMA size 1 ($7\frac{1}{2}$ h.p. on 400 V) being a minimum size, rejecting NEMA size 0 or size 00 as being too small to be reliable on machines when a breakdown would cost far more than the initial cost of the control gear.

Control gear units for a given duty are not likely to become much smaller. The present need is for more space round the units and terminals. The control gear maker can, however, offer more accessible enclosures, particularly if the machine maker will co-operate with the control gear maker at an early stage in the machine design. This is to some extent a counsel of perfection, since machines are developed from other machines and very few designs start *de novo*. The problem of improved access to control gear will therefore be with us for many years yet, but it seems probable that before the next Machine Tool Exhibition in 1956 there will be more instances of what was already evident at the recent exhibition—a tendency to rescue the electrical control gear from inaccessible positions near ground level.

Probably at the same time there will be more attention paid to the interlocking of the main switch on the machine with the door of the main control gear box or cavity.

Certainly all doors which can be opened without tools and enclose electrical equipment should be so interlocked. Some Continental makers cast on the covers of electrical equipment a lightning zig-zag sign to indicate the presence of electrical equipment behind doors which are indistinguishable in type from other doors or covers on the machine. British makers might consider the adoption of some sign which would indicate the presence of electrical equipment; it might also acquire the prestige of indicating some agreement on good practice in both the design and the installation of the electrical equipment of the machine tool, though there are obvious difficulties not only in arriving at such agreement but also in protecting the use of a sign, other than the nameplate of a reputable maker.

ACCIDENTS IN THE HOME

Faulty Bathroom Installations

THE following notes are based on a classified précis of fatal electric shocks on domestic premises last year, the fifth of an annual series which has been prepared by Mr. H. W. Swann for the Home Office. Of the 38 deaths reported, eight occurred in bathrooms, in six of which the sufferer was lying in the bath itself when he or she came in contact with live unearthed frames or faulty connections of electrical apparatus, chiefly heaters.

In one case the victim could hardly have been unaware of the especial precautions necessary when handling electrical apparatus where there are water or damp atmospheres and earthed metal. A foreman electrician, while sitting in his bath, received a fatal shock through touching the screw of an unshielded lampholder cap which he had rigged up in series with another as an infra-red heater, the screw being connected to the live conductor. In another instance the shock was received from the unearthed body of a kettle connected to a two-pin plug on connecting it to a socket-outlet; moisture had seeped through the false bottom and rust formed a conducting track between the kettle body and the heating element.

Amateur extensions and repairs or neglected wear and tear were responsible for several deaths, but not all; the old mistake of installing a single-pole switch in the neutral wire claimed several victims, including one in a bathroom, since seemingly switched-off appliances then remain alive.

Similarly the reversal of a two-pin plug top may have serious consequences. A skilled wireless mechanic was killed while adjusting the outdoor aerial of a television set of his own construction. There was no isolating condenser in the aerial circuit and the aerial coupling coil was not isolated from the chassis. A two-pin plug, inserted the wrong way round in a socket connected to the existing house wiring, made the aerial alive at 230 V.

While the absence of protective earthing contributed greatly to the number of casualties, there were several others in which neglect to maintain continuity of the earth connection led to the same result, particularly when using electric tools and other portable appliances.

A child was electrocuted by placing his face against the metal grille of the loudspeaker of a television set while his bare foot was in contact with the earthed brass fender of an electric fire; one of the screws fixing the grille to a wooden baffle plate was touching the live chassis. Another child suffered the same fate as the result of pulling out a connector in the flexible lead from the mains to a radiogram; the connector had been incorrectly wired so that the contact pins were live when pulled out of the socket. The 18 types of apparatus involved in these accidents are tabulated with a further list of contributory causes.

In addition to the 38 shock fatalities there were 27 known cases (mostly concerning very young or elderly people) in which death resulted from clothing fires caused by inadequately guarded electric fires. Brief particulars are given of six of these.

Commerce and Industry

Lighting Restrictions Removed

Reduced Charges for B.I.F. Stands

THE Minister of Fuel and Power has made the Electric Lighting (Restriction) (Revocation) Order (S.I. 1952 No. 1772) which, by revoking the Electric Lighting (Restriction) Order, 1949 (S.I. 1949 No. 633), removes the restrictions on the use of electricity for business advertisement and on the standard of lighting in shops and other places.

In a statement on the subject last week the Minister (Mr. Geoffrey Lloyd) said that he preferred voluntary co-operation where possible. The situation with regard to peak hours was somewhat better though economy was still necessary. The Electrical Sign Manufacturers' Association had agreed to recommend all persons controlling advertising sites not to illuminate them before 5.30 p.m. on Mondays to Fridays, from 1st November to 31st January next. Mr. F. Gratwick, general secretary of the National Chamber of Trade, said the Chamber had given the Minister certain assurances regarding economies in the use of shop window lighting.

Night Skating at Redcar

When Redcar Corporation decided recently to include night skating at its outdoor roller rink, an interesting lighting problem was raised. Placing the lighting columns at the rink edge would have obstructed the view of spectators. The North Eastern Electricity Board who carried out the work and B.T.H. lighting engineers who planned the installation found the solution in a Mazda "Nine" floodlight which has a particularly wide beam spread and employs a 1,000 watt tungsten lamp. Sixteen of these, mounted on 31ft steel poles, were placed at intervals of approximately 32ft behind the seating accommodation. Light intensities were more than adequate and night skating has become a popular addition to the attractions of this Yorkshire resort.

Floodlighting of the roller skating rink, Redcar

Engineering Wages Claim

Joint and separate meetings took place at the Ministry of Labour on Thursday last week of representatives of the engineering employers and of the trade unions to further consider the position raised by the employers' refusal to concede the unions' claim for a £2 a week wage increase.

It was later reported that the employers' representatives had said that they could not make an alternative offer without first consulting their constituent associations and suggested an adjournment of the discussions until 30th October. The unions, however, said that they adhered to their decision to impose an overtime and piecework ban on 20th October and accordingly the next meeting was arranged for this week.

B.I.F. Charges

The Government is anxious that in Coronation Year the British Industries Fair should be fully representative of the commercial vitality of the country and that overseas visitors should be given a comprehensive view of the wide range of goods which British industry can supply. It has been represented that this object would be helped if some-

thing could be done to reduce the cost of exhibiting. The Board of Trade has decided to reduce the charge to exhibitors for shell stands at Olympia and Earls Court by approximately 9 per cent. It is hoped that industry will take the fullest advantage of this reduction. To facilitate this the Board of Trade will continue to consider applications for space up to 25th October, and the allocation of individual stands will be postponed until that date.

E.I.B.A. Branch Dinner

The annual dinner of the Edinburgh Branch of the Electrical Industries Benevolent Association will be held on 7th November at Adams' Rooms, George Hotel, George Street, Edinburgh.

"Metal Industry" Handbook

The 1952 edition of the "*Metal Industry* Handbook and Directory," which is now available, contains in its 450 pages a wealth of information of value to metal buyers. It is divided into four sections. The first deals with the properties of metals; metal statistics; the various alloys; and specifications. The second contains general data and tables, the third covers electro-plating, polishing and finishing, and the fourth is a directory. Extensive revisions have been made, and the directory of buyers has been considerably enlarged. The handbook is published by the Louis Cassier Co., Ltd., Dorset House, Stamford Street, London, S.E.1, in conjunction with *Metal Industry*, at a combined subscription of £2 12s.

Coronation Decorations

Particulars have been issued jointly by the London County Council and the Metropolitan Boroughs' Standing Joint Committee for the guidance of owners and occupiers of buildings in the County of London who may wish to decorate their premises or to put up temporary stands overlooking the route of the Coronation procession or other similar processions about the same time. Subject to certain conditions the need to obtain the consent of the London County Council to erect signs and decorations which are in the nature of a structure will be waived provided that they do not remain for more than one month from 2nd June. Decorations must be well clear of any electrical installation, and any electrical work must be carried out in accordance with the I.E.E. Regulations. The decorations must be non-advertising.

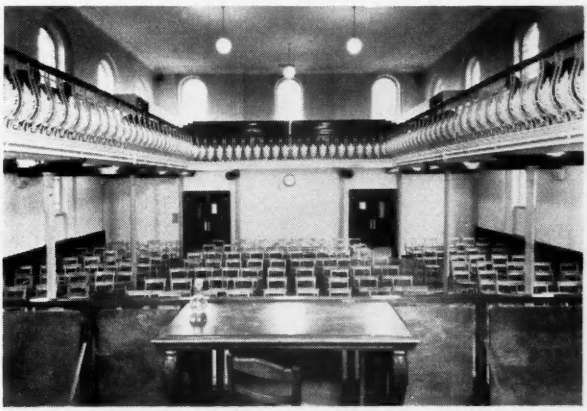
Salary Increase Awards

The Industrial Court which on 26th September heard a claim on behalf of administrative, clerical and commercial staffs in the electricity supply industry for a pay increase of at least 10 per cent has now made known its decision. The Court has awarded increases of from £10 to £20 a year affecting about 41,000 employees, operative from 1st August. The new scale for boys and men in the general clerical grade ranges from £160 to £450 (against £150 to £430), with proportionate increases for girls and women. For higher clerical, administrative and commercial staffs the new rates range from £380 to £1,090 (against £360 to £1,070).

The Civil Service Arbitration Tribunal has raised the salaries of telephone managers in Central London from £1,425 to £1,550, and managers in other London areas from £1,285 to £1,400. The minimum for provincial areas is now £1,250 rising to £1,500.

Heating a Community Centre

A new community centre has been opened by the Field Lane Institution in Cubitt Street, London, W.C.1, where homeless people may be given practical aid. The premises in which the centre is situated have been leased by the trustees of Ampton Street Baptist Church. They were seriously damaged by bombing in 1941 and the premises have been redecorated, and a great deal of new equipment installed including a complete system of electric heating, planned by the General Electric Co., Ltd. It was decided to heat the church in addition to the basement of the building where free meals



G.E.C. tubular heaters mounted on the gallery at Ampton Baptist Church

are served and social activities undertaken. This called for a system of heating that would allow the equipment to blend with the church's architectural treatment. The tubular heaters finally adopted are in keeping with the general decorative scheme. The tubes, of which there are 542ft in the chapel and gallery, have been wall-mounted. To reduce the pre-heating time, six G.E.C. 3 kW unit heaters have been mounted inconspicuously in strategic positions: with the heater banks isolated and the fans running they also serve the purpose of ventilating the premises in summer weather. Total loading of the installation in the chapel and gallery is 52·88 kW and in the basement, where 192ft of tubular heaters are installed, 11·52 kW. For the use of ministers and other officers of the church, G.E.C. 1½ gallon water heaters have been fitted over the wash basins in the side vestries. The installation was carried out by the Gooding Electrical Co., Ltd.

Contractors' Year Book

The 1952–53 edition of the E.C.A. Year Book again shows expansion; there are now about 740 pages. As in previous years the directory section sets out the membership of the various branches arranged in sections and an alphabetical list of members follows.

Other usual features are the latest presidential address (that of Mr. S. N. Watkins at the Eastbourne conference), qualifications for membership of the Electrical Contractors' Association, industrial agreements, the guarantee of work scheme, a legal section, particulars of the Electrical Fair Trading Policy, etc. The Year Book can be obtained from the E.C.A., 14, Bedford Row, London, W.C.1, price 15s net (1s postage).

Stand-by Television Transmitters

It is announced that one of the two medium-power television installations, comprising 5 kW vision and 2 kW sound transmitters, ordered by the B.B.C. from Marconi's Wireless Telegraph Co., Ltd., in May will be installed as a reserve at Alexandra Palace in time for the Coronation next year. The other installation will be used as a stand-by at Sutton Coldfield.

Anglo-American Engineering Link-Up

R. A. Lister & Co., Ltd., have concluded an agreement for the sole distribution of the Lister range of diesel engines in the United States with the National Supply Co., the head office of whose Engine Division is in Springfield, Ohio, with branches in various parts of the country. Arrangements to this effect were made following a recent visit to the United States by Sir Percy Lister, chairman of R. A. Lister & Co., Ltd., and a subsequent visit to England by F. Howard Kilberry, general manager of the National Supply Co.'s Engine Division. The Lister-Blackstone American Co. will continue to handle other Lister and Blackstone products. A close working association between the English and American companies, in regard to research, production and distribution, is provided for in the agreement. Most of the Lister engine dealers in the United States will be retained. Particular emphasis will be put on the sale of a new line of Lister diesel engines known as the "Freedom" range, first announced in England in May, 1952. These are made in 1, 2, 3, 4 and 6 cylinders, in a range from 8 to 54 h.p. The engines, upon arrival in the United States, will be equipped with American accessories, such as starters, generators, radiators, clutches and marine gears to minimize the service and replacement part problem.

"Wireless World" Diary

The 1953 *Wireless World* diary is now available from the publishers, Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price 6s 1½d in morocco leather or 4s 7d in rexine. In addition to the usual diary section there are 80 pages of technical information and other useful reference matter relating to radio work, radio organizations, etc.

Fuel and Power Discussions

The national fuel and power policy has been used as a basis for lunch-time activities at the Westwood (Wigan) generating station of the North Western Division of the British Electricity Authority. The first of these lunch-time functions took place on 12th September in the form of an "easel" talk given by Mr. V. J. Speller, senior assistant secretary. Mr. J. T. Delamore, station superintendent, was in the chair and he invited the Westwood employees to send in written questions, to be answered during the next few days. The following week ten questions dealing with many aspects of the industry and concerning national fuel and power policy had been submitted. Mr. J. L. Ashworth, chief generation (operation) engineer and Mr. P. H. Flatt, divisional secretary, accompanied Mr. Speller to Westwood and the whole of the lunch-time was taken up in answering the questions and discussing them. Evening lectures have also been arranged at this station. Two requests from other stations have been received and it is hoped to expand the discussions on national fuel and power policy throughout the Division.

British Institute of Management

The annual conference of this Institute is to take place at Harrogate from 13th to 15th November. A wide variety of management subjects will be discussed in session and the advance programme also includes as many as 73 suggested topics for informal discussion groups. The conference is confined to members, associates and subscribers to the B.I.M. (and the Institute of Industrial Administration) and certain other

bodies and specially-invited guests. The conference fee is £4 4s and the inclusive fee (for accommodation, etc.) is £9 9s. The Institute's address is Management House, 8, Hill Street, London, W.1.

We have received from the Institute a copy of No. 1 of its Management Statistics Series—"Danger Figures for Production Management" (price 3s 6d). The term "Danger Figures" is used to denote levels below which performance must not be allowed to fall. Methods of setting and using these standards are discussed.

"Flexibles" Centre

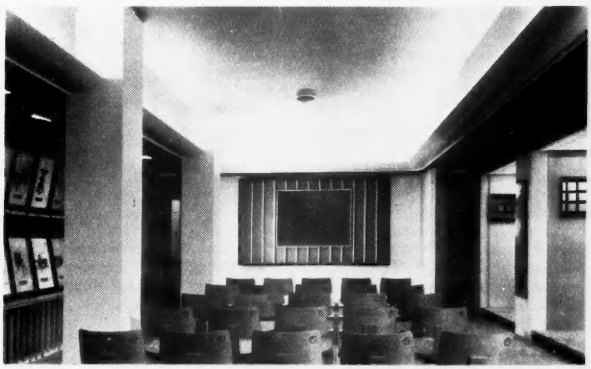
A complete advisory and supply service covering flexible tubing and hoses of all kinds is provided by the Compoflex Co., Ltd., which held a "house warming" at its new London showrooms, 26, Grosvenor Gardens, S.W.1, on 30th September. At these premises samples and installation photographs of hundreds of different "flexibles" are on view and representatives are available to advise manufacturers on all matters concerning the use of flexible tubing and hose.

Trolley-Bus Society

A meeting in the Mechanics' Institute, Bradford, on 3rd October, attended by some thirty people from Bradford and surrounding towns, including Huddersfield and Leeds, resulted in the formation of a Trolley-bus Society, believed to be the first in the country to cater specifically for those interested in that form of transport. Its objects are to study both British and foreign trolley-buses, their construction and the types of vehicles, routes and services.

Ironfounders' New Showroom

On Thursday last week the new headquarters and showrooms of Allied Ironfounders, Ltd., were formally opened by Mr. D. Eccles, P.C., M.P., Minister of Works, at 28, Brook Street, London, W.1, in the presence of a large gathering of representatives of the architectural and building industries. The showrooms are more in the nature of a permanent exhibition, the display being divided into sections each of which has a representative selection of the group's products. It is mainly intended for the use of architects, builders' merchants, officials of housing authorities and local councillors, and students of building and architecture. There are two floors, the ground floor showing space-heating equipment, water-heating and cooking apparatus (including "Falco" electric cookers), and the lower floor, bathroom fittings. This floor has been equipped so that it can be used as a conference room.



One of the new showrooms of Allied Ironfounders, Ltd., which can also be used as a conference room

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £157 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8½d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £99 10s 0d
Foreign	ton £98 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £961 0s 0d
ZINC, G.O.B. Foreign	ton £122 0s 0d
Electrolytic	ton £126 0s 0d
BRASS Tubes	lb 2s 3½d
Sheet	lb 2s 6d
Wire	lb 2s 9d
PHOSPHOR BRONZE	
Wire	lb 4s 1½d
RUBBER, No. 1 R.S.S. spot ..	lb 21½-21⅞d

Faulty Installation Alleged

At Chester County Court last week, the Midlands Electricity Board was ordered to pay a total of £197 17s 6d damages in respect of a fire alleged to have originated from faulty installation by its predecessors in title. The action was brought by the tenant and owners of 20, Grosvenor Road, Market Drayton, who claimed for alleged negligence and breach of duty on the part of the Board. For plaintiffs it was contended that faulty workmanship in external wiring resulted in a fire breaking out

at the meter in February, 1950, two years after the original installation.

Judge H. Emlyn Jones, giving judgment for plaintiffs with costs, said he accepted the plaintiffs' view that the fire was of electrical origin, and that it had been caused through electrolysis set up by faulty workmanship on the part of the Board's servants or its predecessors in title.

Mission to Central America

The President of the Board of Trade announces that, after consultation with the Dollar Exports Council, it has been agreed that a Government-sponsored Trade Mission should leave towards the middle of November for a tour of Venezuela, Colombia, the Dominican Republic, Cuba and Mexico. These countries are in the dollar account area and the Mission will explore the methods by which the United Kingdom can increase its hard currency earnings in these rapidly developing markets. The Mission is expected to spend about six weeks on the tour. Brigadier W. H. Crosland, C.B.E., D.S.O., managing director of Parson & Crosland, Ltd., will lead the Mission, and one of the members is Mr. E. Bruce Ball, managing director of Glenfield & Kennedy, Ltd.

Hoover Apprentices Visit the Continent

For the second year in succession apprentices from Hoover, Ltd., have visited a European country on an exchange system. This year three young men have spent two months each with Brown Boveri at Baden, while one visited the C.E.M. factory at Le Havre.

New Glasgow Showroom

Col. J. R. H. Hutchison, Under-Secretary of State for War, opened new showrooms at 26, Bothwell Street, Glasgow, on 3rd October for Philips Electrical, Ltd. He emphasized the continuing need for light industries in Scotland so that the country would not be wholly dependent on heavy industry. Mr. N. D. Houston, Philips Scottish manager, presided, and Col. Hutchison was thanked by Mr. G. Hofman, managing director. Also present were Sir Joseph Napier, a director of the company, Mr. Hector Thorn, sales manager (radio and television), and Mr. A. Sutherland, commercial manager (radio and television).

Educational

A number of courses on communication techniques have been arranged by the Communication Training Centre of the British Association for Commercial and Industrial Education. These include two meetings arranged in association with Prof. R. O. Kapp, and Mr. B. C. Brookes on "The Presentation of Technical Information." Prof. Kapp is to address a meeting of senior management members on 16th October at Management House, 8, Hill Street, London, W.1, and on 5th January there will be a one-day conference for engineers and other technologists at University College, London.

An advanced course on "Power System Transients" is to be given at Heriot-Watt College, Edinburgh, on six successive Saturday mornings from 18th October. The fee is £2 2s and enrolment forms can be obtained from the secretary of the College, Chambers Street, Edinburgh.

Trade Announcements

A controlling interest in the business of Spare Parts, Ltd., St. Peter Street, Blackburn, has been acquired by **Kerry's (Great Britain), Ltd.** Mr. H. Lonsdale, one of the partners of Spare Parts, is retiring from the business, but the other, Mr. W. Earnshaw, continues as a director.

Mr. R. V. Millington has joined the **Z Electric Lamp & Supplies Co., Ltd.,** as a sales representative, attached to the Nottingham Branch.

Mr. Gladstone Law, of South View, Clayton West, Huddersfield, Yorkshire, has ceased to represent **Herman Smith Smithlite, Ltd.** A new appointment will be made shortly.

Messrs. **W. T. Driver,** makers of the "Empire" electric trouser press have removed to 131-137, York Way, London, N.7 (telephone : Gulliver 6641).

Additional service depots for the testing of Ediswan "Mazda" television cathode ray tubes are now open at 53, Trafalgar Street, Sheffield, 1 (telephone : Sheffield 27004), 53, High Street, Keynsham, Bristol, and at 157a, St. Vincent Street, Glasgow, C.2 (telephone : Central 0687/8/9).

Catalogues and Lists

Aluminium Wire & Cable Co., Ltd., 37, Thurloe Street, South Kensington, London, S.W.7.—Sectionalized catalogue listing "Awco" overhead line conductor accessories (OT.12).

Simplex Electric Co., Ltd., Creda Works, Blythe Bridge, Staffs.—Illustrated priced folder on a new range of electric fires.

Electropower Gears, Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9.—Illustrated descriptive leaflet on geared motors and speed reducers (Cat. 01).

T. B. Morley & Co., Ltd., Jameson Street, Hull.—Booklets 34/752 on decorative glassware and fittings, 26/752 on decorative lighting fittings, and leaflet 35/952 on rustic pendants and brackets.

Croydon Precision Instrument Co., 116, Windmill Road, Croydon, Surrey.—A selection of leaflets dealing with potentiometers and strain measuring bridges.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Prismatic Lighting Fitting

THE "Diopal" industrial prismatic lighting fitting which has just been put on the market by DORMAN & SMITH, LTD., Manchester, 5, is list priced at only 29s. The body is of die-cast aluminium alloy and is tapped with one hole for ¾in conduit, while the front is fitted with opalescent prismatic glass designed to give the widest light distribution. For speed and ease of fixing the two fixing holes are at brick width. The reversible porcelain b.c. lampholders will accommodate lamps rated up to 100 W.

Washing Machine Heater

A heating element designed for use in the Hoover washing machine has just been put on the market by ELTRON (LONDON), LTD., Accrington Works, Strathmore Road, Croydon, Surrey. It is capable of raising the temperature of the water to washing heat in about 30 min, has a loading of 2 kW, and retails at £3 10s (purchase tax extra in the United Kingdom).

Gaslighter Cell

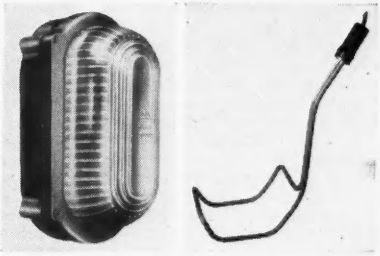
The comprehensive range of lighting batteries made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has been extended by the introduction of the heavy duty 1·5 V BA6121 gaslighter cell which is of 2in diameter and 4 $\frac{13}{16}$in high and fits any standard gaslighter. Its weight is 13½ oz and the list price is 2s 6d.

Watch Timer

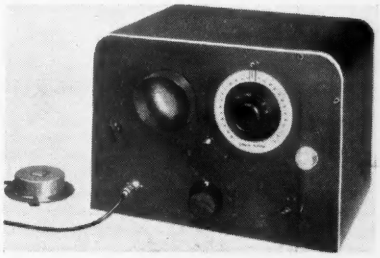
The "Meridian" watch timer brought out by WALKER ELECTRONICS, LTD., 31, Kingsmead Avenue, Worcester Park, Surrey, indicates on a cathode-ray tube the rate of gain or loss in minutes and seconds per day of all the usual types of watch: at the same time, audible signals on a built-in loudspeaker reveal escapement faults.

A stable oscillator (approximately 30 vibrations a second) produces a beam of electrons revolving round the face of the cathode-ray tube. When the watch "tick," picked up by a microphone and amplified, is applied to the tube the light spot produced appears to move round the screen if the watch is not exactly in synchronism with the electronic oscillations, the direction of travel depending on whether the electronic oscillations are relatively faster or slower than those of the watch. In practice the oscillator frequency is varied to synchronize with the "tick" of the movement to be tested, and the frequency read on a scale calibrated in minutes and seconds a day.

The unit weighs 17 lb and measures 13in by 11in by 9 in. It is finished in two-tone grey stone enamel and a fully tropicalized model is available. The standard instrument operates on a 200–250 V a.c. supply.



Left: **Dorman & Smith "Diopal" prismatic lighting fitting.** *Right:* **Eltron immersion heater for the Hoover washing machine**

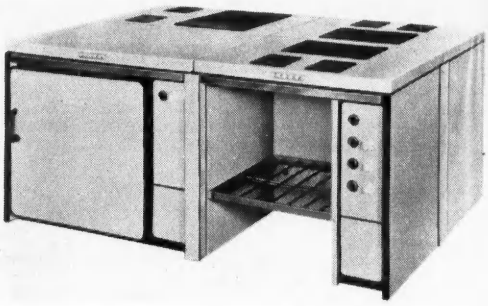


"Meridian" watch timer

Unit Cooking Equipment

Following the introduction of the "Creda" unit type ranges about eighteen months ago, the SIMPLEX ELECTRIC CO., LTD., has now brought out further "unit" type heavy duty cooking equipment comprising two boiling tables (HC.016 and HC.017) and a general purpose roasting oven (HC.4901).

All the units being of the same height (2ft



"Creda" heavy duty cooking equipment island suite comprising HC.4901 roaster (front left), HC.016 boiling table (front right) and HC.4904/6 unit type ranges (rear)

10in) and depth (2ft 4½in) can be butted to other "Creda" unit type equipment to form wall or island formations in any reasonable combination. The method of butting prevents any possibility of dirt, grease or vermin collecting in crevices. The HC.017 boiling table is identical with the HC.016 model except that it is 6in wider (3ft 5½in) and has a 24in by 16in 8 kW instead of a 16in by 12in 4 kW hotplate: both models have in addition two 8in by 6in 1¼ kW hotplates.

The new roasting oven unit, which is also 3ft 5½in wide, has a 24in cube oven loaded at 6·4 kW and equipped with fully automatic heat control by means of a two-stage thermostat. A close-fitting oven door with concealed oven ventilators opens 150 deg. Fuses, thermostats, switches and elements are easily replaced from the front.

The standard exterior finish of all units is silver-grey mottled vitreous enamel. Alternative colour schemes are available at slight extra cost.

Polished Brass Lampholders

In our reference on 26th September (page 688) to the Edison Swan Electric Co.'s polished brass lampholders we mentioned the company's "Portslade" factory. Actually the additional factory capacity mentioned is at Bristol, the company having no factory at Portslade.

Electrical Harpooning of Whales

AFTER nearly five years of investigation and development by the General Electric Co., Ltd., in close co-operation with United Whalers, Ltd., owners of the *Balaena* whaling fleet, a recent expedition has successfully concluded the work of establishing the economic superiority for modern whaling of the electric harpoon over the present explosive-nose Svend Foyn harpoon (*Electrical Review*, 25th April, 1952).

Sir Vyvyan Board, chairman of United Whalers, Ltd., who accompanied the expedition with Mr. Robert Marsden of the G.E.C., has stated on his return: "We are entirely satisfied with the principle of the electric harpoon and the electrical equipment." Orders are being placed for further complete sets and the development of their use pushed forward as training facilities and the equipment become available.

It is interesting to record that the recent expedition killed the largest fin whale of the season, 65ft in length and weighing approximately 70 tons, which was brought alongside the catcher, inflated with air and left floating with the house flag flying within ten minutes of the firing of the harpoon.

Considered first from the humane aspect, the system appears to kill nearly instantaneously or in a minute or so at the most. A whale thus hit is undoubtedly unconscious and paralysed in a rigid state immediately the harpoon penetrates and the mammal comes to the surface in this state, even if hit at the moment of sounding.

From the commercial viewpoint, the saving in time is really outstanding. There is no need to "play" the whale by feeding-out hundreds of fathoms of heavy whale-line, since the mammal, when struck, lies in the water without struggling to escape. In addition, the saving in oil and meat products is quite considerable: apart from the very much lesser risk of infection such as frequently follows the internal destruction caused with the explosive-nose method. Observers also agree that more latitude is allowed to the gunner, since the harpoon head need only penetrate the blubber layer in any part of the body to be immediately effective.

A large amount of work and experiment has gone into the production of electrical conductors to be carried in the forerunner ropes, and a very satisfactory range for both manila and nylon construction is now available from the Southampton factory of the Pirelli-General Cable Works, Ltd.

The Elektrohval Co. of Oslo has worked in close collaboration in these experiments from the beginning.

ELECTRICITY SUPPLY

Recent B.E.A. Contracts

Inauguration of River Erne Project

DURING the past month the British Electricity Authority has placed contracts for equipment for power stations, transforming stations and transmission lines amounting in the aggregate to £6,468,387. The principle contracts include the following:—

Brunswick Wharf power station, London: One 320,000 lb hr boiler.—J. Brown & Co., Ltd.

Marchwood station, near Southampton: Civil engineering works.—Sir Robert McAlpine & Son, Ltd.

Tilbury station: 3,300 V and 415 V auxiliary switchgear and accessories.—English Electric Co., Ltd. Ash and dust handling plant.—Babcock & Wilcox, Ltd.

Drakelow station, Burton-on-Trent: 132 kV 3,500 MVA switchgear.—A. Reyrolle & Co., Ltd.

Nottingham station: Condensing and feed heating plant for one 60 MW turbo-generator.—Metropolitan-Vickers Electrical Co., Ltd.

Hams Hall "C" station, Birmingham: Initial site works.—Sir Robert McAlpine & Sons (Midlands), Ltd.

Southport station: One 85,000 lb hr oil fired boiler.—Yarrow & Co., Ltd.

Stella South station, near Newcastle-upon-Tyne: 132 kV transformers.—C. A. Parsons & Co., Ltd.

Carrington station, near Manchester: Brick chimney.—P. C. Richardson & Co. (Middlesbrough), Ltd.

Fleetwood station: Roads, drains and ancillary works.—M. J. Gleeson (Contractors), Ltd. Brick chimney.—J. Gerrard & Sons, Ltd.

Three Bridges substation, Sussex: Site and foundation works.—Thomas Lowe & Sons, Ltd.

Staythorpe substation, Newark: 132 kV 2,500 MVA switchgear.—General Electric Co., Ltd.

Stella substation: 275 kV isolators and connections.—A. Reyrolle & Co., Ltd.

Stella South substation: 132 kV and multicore cables.—British Insulated Callender's Cables, Ltd.

Carrington substation: 132 kV 3,500 MVA switchgear and 275 kV isolators, busbars and connections.—Metropolitan-Vickers Electrical Co., Ltd.

Nottingham Power Station Extensions

The Minister of Fuel and Power has granted permission to the British Electricity Authority to proceed with extensions to Wilford power station, Nottingham, which will add 60,000 kW to the existing capacity of 254,000 kW. No date for the start of this new project, scheduled to operate in 1956, has been fixed.

Uskmouth Nearly Ready

Municipal and civil engineers who visited the site of the new Uskmouth power station recently were told by Mr. N. S. Williams, resident engineer for Messrs. L. G. Mouchel & Partners, that the station would probably start generating for public supply in November. Work was expected to begin within the next twelve to eighteen months on a "twin" station alongside the present building.

A scheme, involving considerable engineering work, for dealing with the large quantities of coal required to feed the new generating station has been brought into operation by British Railways, Western Region. The three miles of single track on the East Usk branch which leaves the South Wales main line near Somerton Road Bridge, Newport, has been converted into double track, necessitating the widening of several bridges. Two new signal boxes have been erected, one near the Corporation Road Bridge and the other at Uskmouth at the end of the branch line, which connects with the extensive siding layout of the British Electricity Authority. When the new power station is completed it is anticipated that 12 to 14 trains of coal will pass through daily.

Lighting of Zebra Crossings

The latest move to fit Zebra crossings with standardized permanent lighting took shape in recent experiments outside the Town Hall at Ealing. Venner flashers were used to give $\frac{3}{4}$ sec "on" and $\frac{3}{4}$ sec "off" periods. This equipment enables all beacons in sight to be synchronized to flash "on" and "off" together, without interconnecting wires.

An illuminated beacon fitted with a Venner flasher

Although this equipment has been developed without a formal Ministry specification, orders have already been placed in anticipation by a number of municipalities.

Resale of Electricity

Legislation to protect people against excessive charges in the resale of electricity is called for in a resolution passed by the South Eastern Electricity Consultative Council. Fr. T. A. Keniry (Minster, Kent), in proposing the resolution, said that cases had been brought to the notice of the Council where consumers were being exploited. It happened where the supply was given to a householder who then installed a meter and charged the tenant or sub-tenant an extra amount. There were restrictions on the resale of gas and similar provisions should be incorporated in the Electricity Act.

Sales and Tariffs

Addressing the East Midlands Electricity Consultative Council last June, Mr. C. R. King, chairman of the Electricity Board, anticipated that the next month or two would bring a clearer picture of the trend of electricity sales. He had to admit, however, at the Council's meeting on 1st October, that the outlook remained uncertain. In June and August the sales had been less than a year ago and in July slightly more, while the maximum demand continued to increase by an average of 6 per cent over that for the corresponding period of last year. They must now face the probability of another substantial deficit next March, but this was no justification for hasty measures. The Board thought it preferable to postpone further consideration of the matter until November when the figures for the first six months of the year would be available.

Irish Scheme Inaugurated

Mr. Sean Lemass, Irish Minister for Industry and Commerce, last week officially opened Ireland's biggest hydro-electric project since the Shannon scheme was completed 25 years ago. This was the new generating station at Cathaleen's Falls, which, with the smaller Cliff station, harnesses a four-mile stretch of the River Erne between the pottery town of Belleek, in Northern Ireland, and Ballyshannon, in the Republic. Technicians from Ireland, Great Britain and Sweden co-operated in the project, which took six years to complete. The Erne scheme will have a potential output of 215 million kWh annually. It is the result of an agreement between the Electricity Supply Board and the Northern Ireland Ministry of Finance for work carried out on the northern side of the border from which an incidental benefit will be the drainage of farm lands.

Mr. Lemass said that the Electricity Supply Board was proceeding on the assumption that the electricity demand would double itself in the next five years, in each of which a new station would come into commission. This would raise the annual output to over 2,000 million kWh, one step ahead of the prospective demand. A further programme for the following five years was now being prepared. The Government, Mr. Lemass said, was committed to a policy of economic expansion and to the creation of all the conditions which would make expansion possible.

Protest Against Installation Charges

Aberdeenshire General Purposes Committee has agreed to make representations to the Electricity Consultative Council on behalf of residents of the Tough district of the county who protested to them about the charges being made by the North of Scotland Hydro-Electric Board for the provision of electricity. In a letter from a committee representing the potential consumers, it was stated that 95 per cent of the people in the district wanted electricity. Forty-two potential consumers had now been asked for guarantee payments ranging from £9 to £100, while sixteen of the largest potential consumers had been asked to make capital contributions of between £120 and £250. The potential consumers regarded the proposed charges as being contrary to the avowed intention of the Government to electrify rural areas.

Assisted Payment of Accounts

The North Western Electricity Board is extending its arrangements for the easy payment of quarterly electricity accounts, hire purchase instalments and simple hire charges, by means of 2s 6d account stamps, to the Burnley, Brierfield, Nelson, Padiham and Colne districts.

Committee to Consider Fuel Charges

Liverpool City Council decided on 1st October to appoint a fuel charges special committee. At an earlier meeting of the Council there was a motion recording the widespread concern caused by the recently revised charges for the supply of electricity and requesting that representations should be made to the authorities concerned to protect the interests of consumers, including the Corporation.

Repairs to Electrical Apparatus

Because of the increasing number of accounts received for repairs to electrical fittings, cookers, etc., in Council houses, Billinge and Winstanley U.D.C. is to ask the North Western Electricity Board whether it can issue instructive leaflets to tenants. The Council feels that some of the tenants may not have had sufficient experience in the use of electrical appliances.

Water Heater Hire Charges

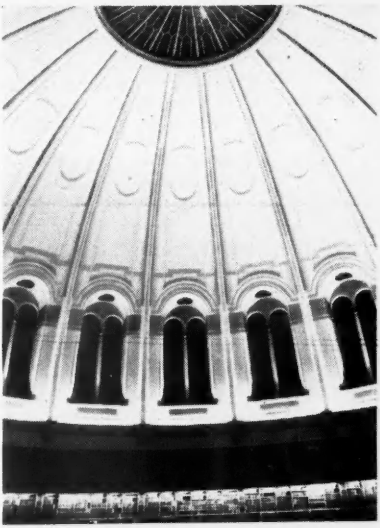
Douglas (I.O.M.) Corporation Electricity Department has decided to increase the hire charges for domestic water heaters by a sum not exceeding 6s a quarter.

British Museum Reading Room

New Lighting Installation

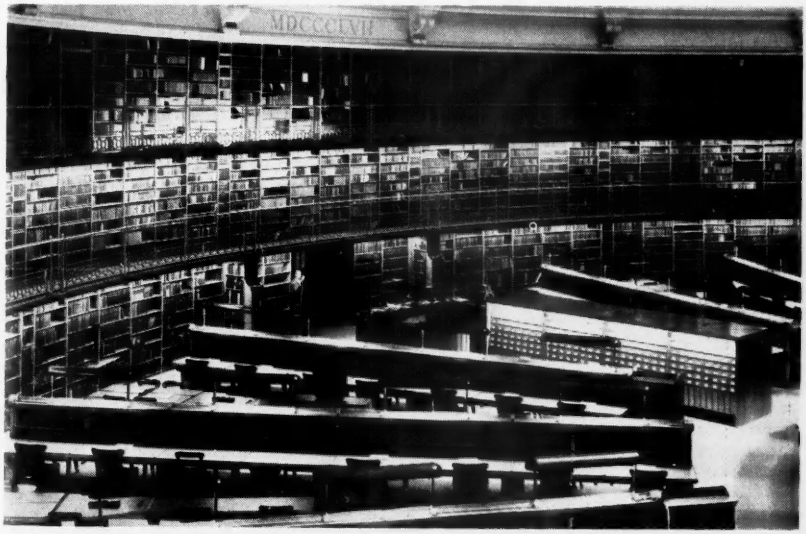
WHEN the British Museum Reading Room was built it is doubtful whether any artificial lighting was intended. The old lighting scheme, which was installed many years ago, consisted of five large opalescent pendants containing 1,000 W lamps suspended from the dome. These provided only a token of general illumination, insufficient for the reading of the titles of the books in the wall stacks.

The readers' tables were provided with local lighting brackets, supporting cardboard shades and 25 W lamps. These were spaced at such intervals that only about one-third of the length of tables received sufficient illumination for reading purposes. It can be imagined that the room had a very



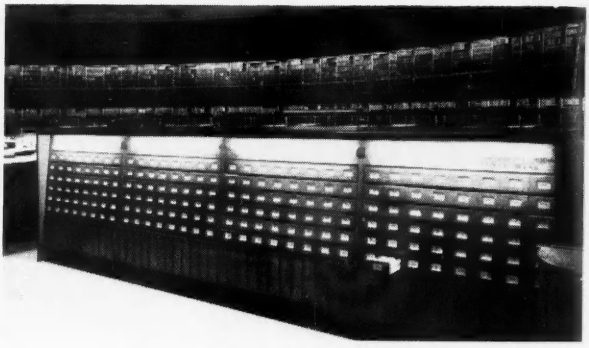
General view of dome showing effect of cornice lighting supplied by sixty 5ft 80 W lamps without reflectors

Test of the new upper stack lighting and illumination of frieze and cornice in the British Museum Reading Room



gloomy appearance at night under these conditions, and, owing to its great size and particular shape, the improvement of the lighting to the standard which is nowadays expected presented a unique problem.

Consideration was first given to pendant fittings of increased output, but this would have meant introducing units of much larger dimensions, with the difficulty of making the design appropriate to the surroundings; also, the roof construction precluded the possibility of using essential lowering gear for maintenance of equipment. It was decided, therefore, to provide all the general illumination from concealed positions, thus preserving an unimpeded view of the dome.



New card index cabinet with built-in lighting

The new scheme consists of sixty 80 W lamps on the cornice which illuminates the ceiling, whilst the necessary downward light is provided by forty 200 W tungsten lamps in concentrating reflectors in the lantern above the central eye of the dome. The treatment of the wall stacks on the ground and first gallery levels is by 20 W fluorescent lamps concealed in the coffered panels under the galleries: a total of 240 of these lamps is used.

The upper stacks, having no gallery above, could not be similarly treated, but at this higher level the general illumination is sufficient for the very limited use of these stacks after dark.

The readers' tables, which are double-sided with a central partition, are provided with bronze reflectors (each housing a 40 W fluorescent lamp) mounted on top of the partition and lighting both ways. This method is not only economical in electricity consumption, but allows the whole length of the tables to be used. Certain tables are illuminated by tungsten lamps and these cater for readers who have an antipathy towards fluorescent lighting.

Each desk in the central-dais, inquiry and catalogue sections has appropriate individual lighting with fittings designed for the purpose.

Altogether there is over 17 kW of fluorescent lighting and 9·3 kW of tungsten filament lamps.

The general lighting is controlled by push buttons and contactors giving one-third, two-thirds or full lighting. For stack lighting there are alternative lamps giving half or full lighting. Lights on readers' tables, sundry desks, etc., are controlled by individual local switches.

The accompanying photographs are reproduced by permission of the Ministry of Works. Redecoration of the Reading Room by the Ministry was begun in November, 1951, and most of the work was completed in June last.

Transport Conversions

EDINBURGH Town Council, by a majority of 10 votes, has decided to substitute motor-buses for the trams within three years. The City Council possesses a fleet of 300 trams operating over 50 miles of track.

Bradford City Council is being recommended by the Finance Estimates Sub-Committee to approve a scheme prepared by Mr. C. T. Humpidge, transport manager, for the conversion of the Wibsey motor-bus service for trolley-bus operation at an estimated cost of £28,855, excluding the cost of the substations.

Sunderland Corporation Transport Committee has approved the complete abolition of the remaining section of the town's tram system within two years. A report by the transport manager (Mr. N. Morton) pointed out that after the Grangetown route was converted to buses there would only be 39 trams in use. Mr. Morton gave reasons why he considered that the trams should be replaced completely.

B.E.A. and Civil Defence

SPEAKING at the inauguration of the first Civil Defence exercise by the British Electricity Authority at its training centre at East Horsley, Surrey, last week, Lt.-Cdr. the Hon. L. W. Joynson-Hicks, M.P., Parliamentary Secretary to the Ministry of Fuel and Power, congratulated the electricity supply industry on the advanced state of its preparedness in Civil Defence, in which it was giving a splendid lead to other industries. Wing Cdr. Sir John Hodsoll, C.B., Director-General of Civil Defence Training, Home Office, also congratulated and thanked the Authority and the officers concerned. Already, he said, the number of Civil Defence personnel trained in the industry was nearing 30,000—about one-sixth of the total employees.

The two-day exercise covered all aspects of Civil Defence in respect of a major atomic bomb incident in an urban area, including assessment of damage, casualties, interruption of public services, etc., and the rescue and handling of casualties, fire fighting and, in particular, the technical and other problems involved in the restoration of electricity supply.

Among those participating in the exercise, who were welcomed by Sir Henry Self, deputy chairman (administration) of the B.E.A., were officers and representatives of Government Departments, the London County Council, borough councils, regional Civil Defence officers, and senior executive officers of the B.E.A. and Electricity Boards.

Power Station Visit

ON 30th September a visit was paid to the new Plymouth "B" power station by the Lord Mayor and Lady Mayoress of Plymouth (Alderman and Mrs. H. E. Wright) and other civic representatives. Also present were the Deputy Lord Mayor and Deputy Lady Mayoress, the Earl of Mount Edgcumbe, the Mayor of Saltash, the chairman of Plympton U.D.C., representatives of commerce and shipping, trade union officers associated with electricity supply in Plymouth, and representatives of the industry's negotiating and advisory machinery. Welcoming the guests, Mr. A. C. Thirtle, divisional controller, South Western Division, British Electricity Authority, said that the station had been in operation since December last year and would be in full production at the end of this year. Of the three new stations in the South Western Division, this was the first to come into operation, the other stations being at East Yelland, near Barnstaple, and the Portishead "B" station near Bristol. The Lord Mayor replied for the guests, and Mr. S. F. Steward, who was present in the dual capacity of a member of the B.E.A., and chairman of the South Western Electricity Board, said that given normal weather conditions there was every prospect of avoiding serious power cuts in the south-west this winter. The guests saw two of the 31·5 MW sets and boilers in operation and inspected the third set and associated boiler now nearing completion.

Public Transport

VISCOUNT SWINTON, Chancellor of the Duchy of Lancaster and Minister of Materials, proposed the toast of the Public Transport Association at that body's annual luncheon on Friday last at the Connaught Rooms, London, W.C.2. In the course of his speech Lord Swinton referred to the Government's Road Transport Bill and said that its aim was to give the public the best possible service and the Government welcomed informed and constructive opinion in ensuring this. Planning might be good or bad, but there was a great difference between strategic planning and tactical interference. There was much talk nowadays of integration and decentralization; he much preferred the latter.

The chairman of the Council of the Association, Mr. Stanley Dudman (who presided) responded to the toast. One of his points was that the rules made in 1930 for the design of vehicles were out of date. There must be greater elasticity if the construction was to keep pace with technical development.

Mr. J. S. Wills (past-chairman) proposed the chairman's health and Mr. Dudman made a brief response.

E.A.W. Conferences

A CONFERENCE of the Midlands and East Midlands Areas of the Electrical Association for Women was held in the De Montfort Hall, Leicester, on Monday last. The main item in the conference was an exhibition showing samples of fires, cookers, irons and vacuum cleaners made as far back as nearly fifty years ago, and indicating the general development and improvement in the make of these appliances up to the present day. Over 400 members attended from E.A.W. Branches.

The Electrical Association for Women is holding a one-day conference on the teaching of electrical housecraft at the Yorkshire Training College of Housecraft, Leeds, on 15th November. This is the first time that such a conference has been held in Yorkshire, although the E.A.W. has arranged other one-day conferences in the Midlands and South Wales and longer conferences in Gloucestershire, Glasgow and London. The sessions will cover the use and care of electric cookers, cooking equipment and refrigerators, the use and care of electrical laundry equipment, and the teaching of electrical housecraft in schools.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Bennis Combustion, Ltd., reports a group net profit for the year to 30th April last, after deducting £22,650 for taxation, of £29,836, as compared with £24,772 for the preceding year. It is proposed to pay a final ordinary dividend of 5 per cent, making 10 per cent on £112,500 capital, as compared with 15 per cent on £75,000 capital in the preceding year.

Scottish Cables (South Africa), Ltd., reports a trading profit for the year ended 30th June last of £197,077, as compared with £123,005 for 1950-51, and after meeting all charges, including £47,222 for taxation, and adding £7,420 brought in, there is a balance available of £122,225 (against £72,929). General reserve receives £60,000, and it is proposed to pay a dividend for the year of 7½ per cent (against 5 per cent). The balance carried forward is £15,236.

Morphy-Richards, Ltd., reports a group trading profit for the year ended 30th June last of £164,383, as compared with £229,723 for the previous year, and after meeting £111,627 for taxation, there is a net profit of £52,756 (against £96,605). The profit of the parent company is £46,971 (against £75,220). It is proposed to pay a final ordinary dividend of 25 per cent, maintaining the distribution for the year at 40 per cent, but on increased capital. The balance carried forward is £19,514 (against £51,708 brought in).

J. & F. Stone Lighting & Radio, Ltd., report a profit for the year to 30th June last of £473,996, as compared with £423,705 for the preceding year, and after deducting £305,598 for taxation, a net profit of £168,398 (against £164,080). The final ordinary dividend is 30 per cent, again making 40 per cent for the year. The balance carried forward is £242,825 (against £170,577 brought in).

The Sturtevant Engineering Co., Ltd., is paying an interim dividend of 5¼ per cent, tax free (same) on increased capital.

It is proposed to capitalize £49,314 of general reserve in paying up 197,256 new 5s shares and issuing them to shareholders on the basis of one new share for every seven held. The new shares will not rank for the interim dividend announced. An extraordinary meeting will be held on 31st October to approve the proposal and also to approve an increase in the authorized capital from £400,000 to £500,000 by the creation of 400,000 new 5s shares.

T. Clarke & Co., Ltd., are paying an interim dividend of 9 per cent (same) on larger capital.

Reliance-Clifton Cables & Industrial Products, Ltd., has announced an interim ordinary dividend of 15 per cent (against 12½ per cent).

The Marconi International Marine Communication Co., Ltd., has declared an interim dividend of 4 per cent (same).

New Companies

Ceramic Platers, Ltd.—Registered 12th September. Capital £10,000. Metallizers, electroplaters, electroformers and workers in all metals; to make ceramics, plastics, glass, synthetic and natural fibre into electrical conductors, etc. Directors: E. T. J. Reading, N. A. Tope and H. Ashton. Regd. office: 443, Foleshill Road, Coventry.

Development Equipment Co., Ltd.—Registered 12th September. Capital £100. Electricians, mechanical engineers and manufacturers of and dealers in electricity, motive power and light; violet ray and X-ray tubes and apparatus. Directors: J. H. Reyner and F. R. Milsom. Regd. office: 16, Shenley Road, Boreham Wood, Herts.

Norwood Electrical Co., Ltd.—Registered 10th September. Capital £100. Electrical, radio, television and refrigeration engineers, etc. Directors: S. G. Agombar, A. Agombar and R. R. Agombar. Regd. office: 373, Norwood Road, Tulse Hill, S.E.27.

Kin-Electric (Contractors), Ltd.—Registered 11th September. Capital £1,000. Manufacturers of and dealers in radio and television sets, etc. Directors: J. S. Thorpe and Mrs. Edna Thorpe. Regd. office: 5, Belmont Avenue, Bulwell, Nottingham.

T.I.C. Transformers, Ltd.—Registered 13th September. Capital £1,000. Electrical transformer manufacturers, etc. Directors: R. G. Richardson and F. M. H. Taylor, addresses not stated.

Motor Winding Co., Ltd.—Registered 26th August. Capital £500. To acquire the

business of a motor winding company, carried on by G. W. Howard, C. T. Kilian and J. F. Palmer at 18, Gipsy Hill, S.E.19, and to carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, etc. Directors : G. W. Howard, C. T. Kilian and J. F. Palmer. Regd. office : 18, Gipsy Hill, S.E.19.

Chapman-Parker (London), Ltd.—Registered 4th September. Capital £100. To acquire the business of manufacturers of and dealers in all kinds of electrical goods and accessories, etc., heretofore carried on by Barbara L. Burgess, S. H. Argent and A. L. Parker, at 10, Station Parade, Balham, as Chapman-Parker. Directors : Barbara L. Burgess, S. H. Argent and A. L. Parker. Regd. office : 266, Mitcham Road, Tooting, S.W.17.

Harry Catchpole (Electrical), Ltd.—Registered 18th September. Capital £1,000. Electrical, constructional, radio, television and general engineers, etc. Directors : H. E. Catchpole and R. Wright. Regd. office : 67/69, London Road South, Lowestoft.

S. & S. Electrical, Ltd.—Registered 18th September. Capital £100. Electrical engineers and contractors, electricians, radio engineers, electric wiring contractors, etc. Directors : H. Solomons and M. Souber. Regd. office : 67/70, Ibex House, Minories, E.C.3.

A. & C. Electric, Ltd.—Registered in Belfast 19th August. Capital £5,000. To acquire the business of electrical engineers and contractors, radio and general engineers, etc., carried on as A. & C. Electric Co. Directors : G. Thompson Carse and A. O'Grady. Regd. office : 30, Donegall Place, Belfast.

Harcourt Refrigeration Co., Ltd.—Registered in Dublin 8th August. Capital £1,000. Manufacturers and dealers in refrigeration machinery and equipment, electrical and mechanical machinery, etc. Subscribers : D. C. Brereton and J. R. Nixey.

Reigate Electrical Co. (Wholesale), Ltd.—Registered 19th September. Capital £15,000. Directors : S. H. Rundle and Mrs. R. H. Rundle. Regd. office : 61, London Road, Reigate, Surrey.

Liquidations

Radio Television Research Finance Corporation, Ltd.—Winding up voluntarily. Liquidators, Mr. C. A. Sparks, 29-31, Euston Road, N.W.1, and Mr. R. A. Rodgers, 25, Bedford Row, W.C.1, appointed 23rd September.

Aston Components & Assemblies, Ltd., manufacturers and assemblers of electrical components.—Winding up voluntarily. Liquidator, Mr. L. J. Judson, Warnford Court, Throgmorton Street, London, E.C.2, appointed 19th September. Particulars of claims to the liquidator by 31st October. This notice is purely formal. All creditors have been or will be paid in full.

Sherborne Electrical Co., Ltd.—Creditors' voluntary winding-up. Meetings 5th November at Carlton Chambers, 25, Baldwin Street, Bristol, 1, to receive an account of the winding-up by the liquidator, Mr. E. B. Bate.

Bankruptcies

J. H. Coupland, carrying on business at 85, Northgate, Canterbury, under the style of E. J. Ratcliff, electrical engineer.—Receiving order made 24th September on debtor's own petition. First meeting to-day (Friday) at the Official Receiver's office, 1, The Parade, Canterbury. Public examination 28th October at the Sessions House, Longport, Canterbury.

T. G. Evett, 3, Lindsey Road, Cleethorpes, Lincs, electrical contractor, trading as "Evetts."—Trustee, Mr. H. S. Bloomer, 3, Flottergate, Great Grimsby, Official Receiver, released 24th September, 1952.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates mentioned :—

24th October

TECNICO. No. B690,028, Class 7. Electric floor polishers (not domestic), electric lawn mowers, sewing machine motors, portable electric drilling machines, spray guns; and magnetos and ignition coils, all for internal combustion engines.—Tecnico, Ltd., Marrickville, N.S.W., Australia. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

KENWOOD. No. B705,698, Class 7. Machines for mixing, pulping, grinding, mincing and shredding foodstuffs; and machines for peeling vegetables.—Kenwood Electrics, Ltd., Kenwood Works, Ripley Street, Old Woking, Surrey.

GUIDE (design). No. 706,635, Class 9. Electric switches and non-insulated parts thereof included in Class 9; and solenoids.—General Motors Corporation, Detroit, Michigan, U.S.A. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

MERIDIAN. No. 708,425, Class 9. Electronic apparatus for measuring the timekeeping of watches.—J. A. Walker, 31, Kingsmead Avenue, Worcester Park, Surrey.

VALBACHROME. No. 700,725, Class 11. Electric light fittings, shower bath fittings included in Class 11, etc.—Valbania, Ltd., Cavendish Engineering Works, Hartington Road, South Lambeth, London, S.W.8.

1st November

SPARCATRON. No. 708,118. Class 9. Scientific and electrical apparatus and instruments and parts of all such goods all included in Class 9.—Sparcatron, Ltd., Abbey Yard, Bath.

GALLIA. No. 691,186, GALLIA (design), No. 691,192, and No. 691,196 (design). All Class 11. Hair-drying appliances and parts thereof included in Class 11; and electric heating apparatus for curling irons.—Gallia, Ltd., 25, Conduit Street, London, W.1.

CEREX. No. 709,183. Class 11. Carbons for electrical purposes.—Charles H. Champion & Co., Ltd., National House, 60–66, Wardour Street, London, W.1.

STOCKS and SHARES

THE industrial markets of the Stock Exchange continue to be governed to some extent by the fluctuations in the Consol market, where the daily variations, if not so pronounced as they were in the early part of the month, are still sufficiently erratic to claim close attention. For the time being, the support recently accorded to British Government stocks by institutional and other substantial buyers has diminished to some extent, but prices remain tolerably firm on the whole. Amongst industrials, the changes since a week ago are mostly small with the majority in the downward direction. Amongst others to show minor losses are Automatic Telephone, 55s, Crabtree, 34s, Enfield Cables, 50s, London Electric Wire, 47s 6d, and Metal Industries, 53s 9d. From the few improvements that have occurred, Babcock & Wilcox stand out with a rise to 70s. There are gains in Henley's Telegraph, Laurence Scott, Mather & Platt, and Anglo American Telegraph ordinary.

Tokyo Electric Sixes

In the list of active stocks which are now popular, Tokyo Electric 6 per cents have taken their place by reason of the interest focused upon Japanese bonds. At the beginning of the present year, Tokyo 6 per cent stood at 127½; now, they are 177½ and optimism looks for the price to go to the neighbourhood of 200. The cause of the boom in Japanese stocks is, of course, the settlement which Japan has agreed to with the holders of her country's bonds. The last coupon paid on Tokyo Electric "sixes" was in 1941.

Market Notes

Morphy-Richards net profit of £47,000 for the year ended last June is some way below the previous figure, but is still well above the earnings of previous years and covers comfortably the maintenance of the ordinary dividend at a total of 40 per cent. The 4s shares are quoted at about 13s 6d, on which the yield works out to 11¾ per cent. Among recent issues, Electric Construction new shares, offered to shareholders at 42s 9d, are quoted at 51s 3d: the last day for renunciation of allotment letters is the 24th of this month. Telephone Manufacturing new 5s ordinary stand at 7s 9d, against the issue price of 5s 9d. Allotments may be renounced until the middle of November.

Holophane Results

Holophane 5s ordinary shares rose to 11s 3d, the best price of the year, following the preliminary profits statement, and the declaration of a 12½ per cent final dividend, making a total of 20 per cent for the year ended last June. This is not only an advance of 5 per cent on the previous rate, but is payable on capital increased since then by 50 per cent as a result of the one-for-two share bonus distributed a year ago. In effect, the amount distributed to stockholders for the latest period is double that paid for 1950–51. This involves, nevertheless, no departure from the company's consistently conservative dividend policy, for the payments take less than one-third of the distributable surplus of earnings. The latter has expanded from £37,000 to £53,700, despite a much larger charge for taxation. The yield on the shares, allowing for the dividend in the price, is now about 9 per cent.

Interim Dividends

Sturtevant Engineering are repeating the action taken a year ago in declaring an interim dividend of 5¼ per cent, and a proposal for a capital bonus, this time of one new share for every seven old shares held, against last year's one-for-six distribution. This will be the fourth share bonus in as many years, during which the issued capital will, as a result, have been more than trebled, to £394,500, without any diminution, so far, in the rate of dividend. The 5s shares are firm at 23s 9d. Reliance Clifton 5s shares were also hard, on the news of an increase in the interim dividend from 12½ to 15 per cent.

Debenture Stocks

Good industrial debenture stocks are in steady demand by investors wanting a better yield than that obtainable from gilt-edged issues, together with specific security and the safeguards provided by a fixed date for the repayment of the capital. Attention may consequently be drawn to a fairly substantial block of English Electric 4 per cent debenture currently on offer at 92⅜, to yield £4 6s 3d per cent, and dated 1965–85. Enfield Cables 4 per cent debenture, redeemable 1961–76, is also available at 85, yielding £4 14s per cent. Globe Telegraph debenture stock 1975–80 gives 4½ per cent at 89¼, and Anglo Portuguese Telephone 5 per cent stock, 1962–67, can be bought at 98. Among Loan stocks, the relatively short-dated Cable & Wireless 4 per cents are offered at 95½. They fall due for repayment at 100 in 1960.

British Electricity Stocks

A week or two ago, it looked as though the uprush of British Government prices during the summer had overreached itself far enough to require a lengthy period of comparative quiet at a lower level. Although still below their recent best, however, most quotations recovered a good part of the reaction, and have since acquired something more nearly approaching stability. British Electricity stocks show rises of 10s over the past week, and the tone at the beginning of the present week was steady.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Pre-vious	Dividend Last	Middle Price 6th Oct. 1952	Week's Rise or Fall	Est. Yield p.c.
Gilt-edged and Overseas Stocks			£ s d		
Brit. Elec. 1968/73	3	3	81	+½	3 11 5
Brit. Elec. 1974/77	3	3	82½	+½	3 12 9
Brit. Elec. 1976/79	3½	3½	89½	+½	3 18 3
Brit. Elec. 1974/79	—	4¼	99	+½	4 5 10
Calcutta Elec. ..	6†	6†	20 6	—6d	5 17 1†
East African Power	7	7	21 6	—6d	5 14 3
Nigerian Elec. ..	10	10	21 3	—	—
Palestine Elec."A"	5†	Nil	12 6	—	—
Perak Hydro-Elec.	Nil	Nil	13 9	+1/-	Nil
Equipment and Manufacturing					
Aberdare Cables (5/-)	20	20	13 6xd	+6d	7 8 3
Aerialite (1/-) ..	83¼	88¼	8 3	—	10 11 2
Aron Elec. Ord. ..	15	15	33 9	—	8 17 9
Assoc. Elec. Ord..	20	20	71 6	—	5 12 0
Automatic Tel. & El.	15	15	55 -	—1/16	5 9 1
Babcock & Wilcox	18	18	79/-	+1/16	5 2 10
Baldwin, H. J. (2/-)	25	25	4 3	—	11 15 4
Bakelite (10/-) ..	—	—	17 6	—	—
British Aluminium	10	12	13 3xd	—	5 10 10
B.J. Callender's ..	7½	9	32 6	—	5 10 9
British Thermostat (5/-)	30	30	27 -	—	5 11 1
British Vac. Cleaner (5/-)	25	25	13 -	—	9 12 4
Brook Motors (10/-)	20	20	28 9	—	6 19 2
Brush Ord. (5/-) ..	10	10	1 9	—6d	10 10 6
A. F. Bulgin (1/-)..	27½	30	2 6	—	12 0 0
Burco (5/-) ..	42½	38½	20 9	—	9 6 8
Chloride El. Storage	15	15	58 9xd	—9d	5 2 0
Cole, E. K. (5/-) ..	25	25*	16 -	—	7 16 3
Cossor, A. C. (5/-)	Nil	10	8 9	—3d	5 11 3
Crabtree (10/-) ..	17½	17½	34 -	—1 -	5 3 0
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9 -	—	6 5 0
De La Rue (5/-) ..	50	35*	9 6	—6d	—
Decca (1/-) ..	112½	112½	18 -	—	6 5 0
Dewhurst (2/-) ..	35	22½*	4 3	—	—
Dictograph Tel.(2/-)	20	20	4 9	—	8 8 6
E.M.I. (10/-) ..	8	12	15 9	—	7 12 3
Electrical Components (5/-) ..	20	20	10 -	—	10 0 0
Elec. Construction	15	15	50 -	—1/16	6 0 0
Enfield Cable Ord.	7½	7½	23 9	—	6 6 1
English Electric ..	15	15	55 6	—	5 8 1
Ericsson Tel. (5/-)	22†	22*†	39 6	—6d	2 15 8†
Ever Ready (5/-)	35	35	25 6	—	6 16 7
Falk Stadelmann	15	15	38 -	—	7 17 10
G.E.C. Ord. ..	17½	22½	39 6	—6d	5 14 0
General Cables (5/-)	30	30	14 6	—	10 6 10
Greenwood & Batley	15	15	37 -	—	8 2 2
Hackbridge Cable (5/-)	20	20	11 3	—	8 17 10
Hackbridge Hewittic (5/-)	18	20	16 3	—	6 3 0
Hall Tel. Acc.(10/-)	10	10	10 6	—	9 10 6
Hartrae (2/-) ..	12½	12½	4 -	—	6 5 0
Henleys (5/-) ..	20	20	17 3xd	+6d	5 16 0
Holophane (5/-) ..	15	20	11 3	+6d	8 17 10
Hoover (5/-) ..	37½	35*	24 -	—	7 5 9

Company	Dividend Pre-vious	Dividend Last	Middle Price 6th Oct. 1952	Week's Rise or Fall	Est. Yield p.c.
Equipment and Manufacturing (continued)			£ s d		
Intl. Combustion (5/-)	20	25	23 6	—3d	5 6 5
Johnson & Phillips	15	15	53 3	—	5 12 9
Lancashire Dynamo	22½	12½*	42 6	—	5 17 8
Laurence, Scott (5/-)	12½	15	12 9	+6d	5 17 8
London Elec. Wire	10	12½	47 6	—9d	5 5 2
J. Lucas	17½	7½*	33 9	—	4 9 0
Marryat & S. (2/-)	22½	22½	5 -	—	9 0 0
Mather & Platt ..	12½	12½	42 6	+6d	5 17 8
Metal Industries ..	10	15	38 6	—	—
Mid. Elec. Mfg. ..	15	15	53 9	—¼	5 11 6
Murex	12½	15	54 -	—6d	5 11 1
Newman Ind. (2/-)	6	10	2 3	—	8 17 10
Oldham & Son (1/-)	30	35	3 -	—	—
Parnall (Yate) (5/-)	6	6	4 3	—3d	7 1 2
Parsons, C. A. ..	15	10*	52 6xd	+6d	—
Plessey (5/-) ..	20	22½	18 9	—	6 0 0
Pye Deferred (5/-)	18	18	15 -	—	6 0 0
Revo (10/-) ..	27½	27½	39 3	—	7 0 1
Reyrolle	15	10*	47 6	—	—
Scot. Cable (4/-) ..	30	32	11 3	—	—
Siemens Ord. ..	10	10	33 -	—	6 1 3
Strand Elec. (5/-) ..	17½	17½	8 9	—	10 0 0
Sturtevant (5/-) ..	16¼†	17¼*†	23 9	—	—
Switchgear & Cowans (5/-)	22½	22½	13 9	—	8 3 8
Taylor T. (5/-) ..	20	20	20 -	—	5 0 0
T.C.C. (10/-) ..	20	20*	37 6xd	+6d	—
T.C. & M.	10	10	25 6	—	—
Telephone Mfg. (5/-)	10	10	7 6	—	—
Thorn Elec. (5/-) ..	10	12½	8 6	—	7 7 0
Tube Investments	25	25	55 3	—	—
Vactric (5/-) ..	Nil	Nil	3 9	—	Nil
Veritys (5/-) ..	Nil	7½	4 9	—	7 18 0
Walsall Conduits (4/-)	70	70	45 -	—	—
Ward & Goldstone (5/-)	45	45*	29 -	—	—
Watford (2/-) ..	25	25	6 3xd	+1½d	8 0 0
Westinghouse Brake	14	14	50 9	—6d	5 10 3
West, Allen (5/-) ..	12½	15	10 3	—	7 6 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord.	4½	4½	81½	+2	5 9 0
Ord.	56/3	57/6	55	—	5 4 7
Anglo-Portuguese	8	8	20 6	—3d	7 16 1
Brit. Elec. Traction: Def. Ord. ..	22½	25	125	—10	5 17 8
Cable & Wireless: Ord.	6	8	124½	—	6 8 6
4% Loan ..	4	4	95½	—	4 3 9
Calcutta Trams ..	6†	6†	22 6	—6d	5 6 8
Cape Elec. Trams	4	5	12 6	—	8 0 0
Marconi Marine ..	7½	10	30 6	—9d	6 11 2
Oriental Tel. Ord.	16	16	55 9	—	—
Telephone Props..	8	8	30/-	—	5 6 8
Tele. Rentals (5/-)	10	10	8 6	—	5 17 8

* After capital bonus.
† Dividends are paid free of Income Tax.

NEXT WEEK'S EVENTS

Monday, 13th October

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Inherent Current, Voltage and Speed Control in Dynamo-Electric Machinery," by J. C. Macfarlane, J. W. Macfarlane and W. I. Macfarlane.

BRISTOL.—S.W.E.B. Offices, Colston Avenue, 6 p.m. I.E.E. Western Centre. Chairman's Address, by A. C. Warren.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Chairman's Address, "The Protection of Running Buses," by B. L. A. Ellings.

66, Portland Place, W.1, 5.45 p.m. Institute of Transport. Presidential Address.

MANCHESTER.—16, St. Mary's Parsonage, 7 p.m. Junior Institution of Engineers, North Western Section. Presidential Address.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. Chairman's Address, by H. Leyburn.

READING.—3–5, Market Place, 7 p.m. I.E.E. District Meeting. "Domestic Electrical Installations: Some Safety Aspects," by H. W. Swann.

SHEFFIELD.—The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Hospital Lighting," by M. W. Peirce and D. J. Reed.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Local Section. Annual general meeting and Chairman's Address, "Some Features of the Rolling of Steel Sections," by W. H. Bailey.

Monday, 13th October, and Tuesday, 14th October

WORTHING.—Worthing Golf Club. Electrical Industries National Golf Championship Final.

Tuesday, 14th October

BELFAST.—Presbyterian Hostel, Howard Street, 6.45 p.m. I.E.E. Northern Ireland Centre. Chairman's Address, by H. Weston.

BOLTON.—Balmoral Hotel, Bradshawgate, 7.30 p.m. A.S.E.E. Bolton Branch. "The Ductube System" (illustrated).

CAMBRIDGE.—Cambridgeshire Technical College, 6 p.m. I.E.E. Cambridge Radio Group. Chairman's Address, by K. N. Hawke.

EDINBURGH.—25, Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. "Insulation," by a representative of Wm. Kenyon & Sons, Ltd.

LEEDS.—College of Technology, 6.30 p.m. I.E.E. North Midland Centre Discussion Circle. Discussion on "Training for Management," opened by R. Shilton.

LIVERPOOL.—Institute of Welding, Liverpool Branch. "Recent Developments in Arc Welding Electrodes," by D. Young.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. Discussion on "The Teaching of Chemistry to Engineers," to be opened by Dr. J. E. Garside.

At the Royal Institution, Albemarle Street, W.1, 6 p.m. Illuminating Engineering Society. Presidential Address, by W. J. Wellwood Ferguson.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Centre Utilization Group. "A Logical Approach to the Problems of Space Warming by Electricity," by D. H. Parry.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, East Lancashire Branch. "Power Factor Correction," by C. W. Sutcliffe.

NEWPORT.—Tredegar Arms Hotel, 7 p.m. Newport and District Electric Club. "Electricity in the Plating Industry," by F. W. Baker.

Tuesday, 14th October, and Wednesday, 15th October

LONDON.—Horticultural Hall, Westminster. Engineering Industries Association. London Regional Display.

Wednesday, 15th October

BIRMINGHAM.—Imperial Hotel, 6.30 p.m. Institution of Heating and Ventilating Engineers, Birmingham and District Branch. "Practical Aspect of Heating and Ventilating," by J. H. Evans and T. Cornwell.

BLACKBURN.—Chamber of Commerce, Richmond Terrace, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "Steam and Hot-water Storage," by W. Goldstern.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Chairman's Address, by Dr. E. C. S. Megaw.

I.E.E. London Students' Section, 9.30 p.m. Visit to the Associated Newspapers, Ltd., Northcliffe House, E.C.4 (repeat visit on 16th October).

35, Grosvenor Place, S.W.1, 6.30 p.m. Electrical Association for Women, London Branch. Talk by Dame Caroline Haslett on her visit to Canada and the U.S.A.

MANCHESTER.—Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. Lecturettes by members.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-side Group. "Black Light," by H. L. Privett.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre Students' Section. Chairman's Address, "The Contact Rectifier," by D. R. Smith.

SALISBURY.—17, New Canal, 6.30 p.m. I.E.E. Southern Centre. "The Electricity Supply Industry," by E. J. Logan.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. Chairman's Address, by F. Seddon.

WIMBLEDON.—The Guild House, 32, Worple Road, 8.15 p.m. A.S.E.E. South-West London Branch. "Single Phase Motors," by A. N. D. Kerr.

WOLVERHAMPTON.—Institute of Welding, Wolverhampton Branch. "The Development of Metallic Arc Welding and Electrodes during the past Half Century," by E. Flintham.

Thursday, 16th October

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. Chairman's Address, by P. J. Dowling.

EXETER.—Rougemont Hotel, 3 p.m. I.E.E. South Western Sub-Centre. Inaugural Address, "Electricity in the Dairy Industry," by R. H. Cotton.

LONDON.—Dorchester Hotel, Park Lane, W.1, 7 for 7.30 p.m. Institution of Mechanical Engineers. Annual dinner.

Institute of Welding, South London Branch. "New Ideas on the Welding of Aluminium," by P. T. Houldcroft.

Caxton Hall, Westminster, 2.30 p.m. Diesel Engine Users' Association Presidential Address, "Diesel Digestion," by Gerald B. Fox.

SWANSEA.—Central Public Library, 6 p.m. I.E.E. West Wales Sub-Centre. Chairman's Address, by D. L. J. Powell.

Thursday, 16th October, to Saturday, 18th October

BIRMINGHAM.—Town Hall. Institution of Works Managers. National Conference.

Friday, 17th October

BIRMINGHAM.—Grosvenor Suite, Grand Hotel, 7 p.m. Birmingham Electric Club. Ladies' Evening.

Midland Hotel, Institute of Directors, West Midlands Branch. Dinner.

(*Continued at foot of page* 815)

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 26th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1948

2190. Atherton, A. H.—Thermionic valves utilizing secondary electron emission amplification. 1st January, 1949. (683061.)

5990. Director of the Office of Technical Services, Department of Commerce.—Magnetrons. 27th February, 1948. (682761.)

15813. Standard Telephones & Cables, Ltd., Brown, A., and Mullarkey, A. J.—Axle counting for railway signalling. 11th June, 1948. (683022.)

18147. Offner, F. F.—Electrical speed control system. 6th July, 1948. (682763.)

1949

1321. Boswell, I. L., and Planer, G. V.—Electro-acoustic transducers. 17th January, 1950. (682944.)

1911. Postmaster General.—Radio communication systems. 9th May, 1950. (682844.)

3305. Senne, E. P.—Air-filtering machines particularly for use as vacuum cleaners. 7th February, 1949. Cognate application 3306. 3rd January, 1949. (682845.)

4366. Mullard Radio Valve Co., Ltd., and Jones, E.—Thermionic valve amplifiers. 17th February, 1949. (682767.)

5166. Hawkins, P. O., and Buckingham, J.—Electronic attenuator or modulator of guided electromagnetic waves. 23rd May, 1950. (682949.)

7869. Roe Canada, Ltd., A. V., Avery, B. A., Laviolette, J. P., and Boyd, W.—Providing fine running clearance for the blades of turbines, compressors or like bladed fluid-flow machines. 21st March, 1950. (682951.)

10225. Radio-Industrie.—Synchronization of pictures in television. 14th April, 1949. (682847.)

13999. Yorkshire Electricity Board, and Mell, R. E.—Apparatus for testing the speed of rotating bodies. 25th May, 1949. Addition to 649341. (682863.)

14248. British Thomson-Houston Co., Ltd., and Ludbrook, L. C.—Electric motors. 29th March, 1950. (682956.)

14443. Maley, A. W., and Taunton, E. M.—Suspension of electric railway and tramway vehicles and of the motors thereon. 24th May, 1950. (682772.)

16443. Electric & Musical Industries, Ltd.—Circuits for generating sawtooth waveforms. 24th May, 1950. (682864.)

23074. Soc. des Usines Chimiques Rhonepoulenc.—Electrical insulating materials. 6th September, 1949. (683068.)

25513. General Electric Co., Ltd., Busby, T. S., Manners, M., and Partridge, J. H.—Refractory materials. 20th September, 1950. (682961.)

26461. General Electric Co., Ltd., and Curtis, P. B.—Quenching apparatus. 16th October, 1950. (682777.)

27391. Radio-Industrie.—Electric transmission systems making use of synchronization pulses, in particular for television. 25th October, 1949. (682873.)

27974. British Thomson-Houston Co., Ltd., and Gibson, A. C.—Dash-pots for use in electric protective devices. 13th September, 1950. (682962.)

28071. Backer, C. B.—Multiple coil tubular electric heating element. 2nd November, 1949. (683029.)

32652. Compagnie Générale de Télégraphie sans Fil.—Calculating machines. 20th December, 1949. (682782.)

33272. Soc. d'Études de Machines Thermiques.—Power plant. 29th December, 1949. (682881.)

33482. Verdik, Ltd., and Steynor, D. V.—Electro-magnetic actuators. 22nd September, 1950. Cognate application 8193, 31st March, 1950. (683032.)

1950

2506. British Thomson-Houston Co., Ltd.—Steam flat-irons. 31st January, 1950. (682970.)

4793. Electrical & Auto Products (1931), Ltd.—High-tension testing devices. 23rd February, 1951. (683034.)

7034. Dehn, S. G. (Globe-Union Inc.).—Layerized high-dielectric-constant piece for capacitors and process of making same. 21st March, 1950. (682794.)

7990. Telefonbau und Normalzeit Ges.—Electric secondary clocks. 30th March, 1950. (682979.)

9906. Ingram, H.—Fixed electrical condensers. 23rd April, 1951. (682856.)

11520. Standard Telephones & Cables, Ltd.—Method of line scanning for automatic telephone systems. 9th May, 1950. (682985.)

11661. British Telecommunications Research, Ltd.—Mounting arrangements for electrical components. 1st May, 1951. (682799.)

12524. Carr Fastener Co., Ltd.—Holders for electric lamp bulbs and like electrical devices. 27th April, 1951. (682800.)

12801. British Dielectric Research, Ltd.—Assembling of elastic articles in rigid apertures. 21st May, 1951. (682859.)

14779. Metropolitan-Vickers Electrical Co., Ltd.—Electronic pulse generators. 21st March, 1951. (682882.)

14884. Philips Electrical Industries, Ltd.—Tuning indication arrangements for wireless receivers. 14th June, 1950. (682805.)

15272. British Thomson-Houston Co., Ltd.—Methods and apparatus for introducing lubricant into powdered materials. 19th June, 1950. (683037.)

15798. Siemens & Halske Akt.-Ges.—Teleprinter apparatus, working on the start-stop principle. 23rd June, 1950. (682807.)

17095. Marconi's Wireless Telegraph Co., Ltd.—Modulation control circuits for modulated carrier wave transmitters. 4th April, 1951. (682808.)

17214. British Thomson-Houston Co., Ltd.—Resistance materials and elements. 10th July, 1950. (682887.)

19803. Western Electric Co., Inc.—Methods of forming mercury-wettable surfaces. 9th August, 1950. (682815.)

Next Week's Events—*continued*

Friday, 17th October

LONDON.—Caxton Hall, Westminster, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "A Centenary of Engineering," by W. T. O'Dea.

Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. Presidential Address, "The Art of the Practical Engineer," by Sir David Pye.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Electronics in Engineering," by F. C. Robinson.

SOUTHAMPTON.—Royal Hotel. Purchasing Officers' Association, South of England Branch. Third Annual Dinner, followed by cabaret.

20243. Koppers Ges., H.—Electrically driven reversing machines for regenerative ovens or the like. 15th August, 1950. (683039.)

20246. British Thomson-Houston Co., Ltd.—Electric valve converting systems. 15th August, 1950. (683040.)

20423. Standard Telephones & Cables, Ltd.—Electric signalling lines. 10th August, 1951. (682817.)

22325. Andre, H.—Low-voltage electro-chemical condenser of high specific capacity. 11th September, 1950. (683002.)

23880. Loewe Opta Akt.-Ges.—Method of magnetic sound recording and/or sound reproducing. 29th September, 1950. (683090.)

26051. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij.—Infra-red fluid analysing apparatus. 25th October, 1950. (682903.)

26250. Philips Electrical Industries, Ltd.—Circuits for use in automatic telephone exchange and like systems for operating numerical selectors. 27th October, 1950. (683005.)

29858. Philips Electrical Industries, Ltd.—Electric transformers or inductances. 6th December, 1950. (682830.)

29880. British Thomson-Houston Co., Ltd.—Machines for washing dishes and the like. 6th December, 1950. (683047.)

30342. British Thomson-Houston Co., Ltd.—Clothes wringers. 12th December, 1950. (683009.)

31597. Radio Corporation of America.—Cathode-ray deflection circuits. 29th December, 1950. (682834.)

1951

940. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 12th January, 1951. (683056.)

1694. Allmanna Svenska Elektriska Aktiebolag.—Arrangement of static current convertors. 23rd January, 1951. (682743.)

1735. Research Corporation.—Interlocking electric switch and door constructions. 23rd January, 1951. (682744.)

2950. Centre National de la Recherche Scientifique.—Manufacture of permanent magnets made of oxides. 6th February, 1951. (682838.)

4337. Herold, V.—Methods of producing electrodes for alkaline accumulators, and in particular negative electrodes. 22nd February, 1951. (682748.)

4455. British Thomson-Houston Co., Ltd.—Voltage regulating apparatus. 23rd February, 1951. (683100.)

4855. Standard Telephones & Cables, Ltd.—Electric signal responsive and integrating devices. 28th February, 1951. (683102.)

5321. Automatic Electric Laboratories, Inc.—Non-linear resistors. 5th March, 1951. (683103.)

5538. British Thomson-Houston Co., Ltd.—Electric incandescent lamps. 7th March, 1951. (683104.)

5636. British Thomson-Houston Co., Ltd.—Apparatus for dyeing textile materials. 8th March, 1951. (683105.)

7602. Landis & Gyr Akt.-Ges.—Reactive power meter. 2nd April, 1951. (683110.)

8074. Globe-Union, Inc.—Multiple capacitor unit. 6th April, 1951. (683015.)

9789. Aktiebolaget Bofors.—Apparatus for carrying out frequency analysis of transmission systems. 26th April, 1951. (683111.)

11162. Radio-Industrie.—Television synchronizing systems. 14th April, 1949. Divided out of 682847. (683114.)

13625. Forges et Ateliers de Constructions Electriques de Jeumont.—High power circuit breakers having arc extinguishing means. 8th June, 1951. Addition to 615749. (683116.)

15991. British Thomson-Houston Co., Ltd.—Burner apparatus comprising means for cleaning a burner nozzle. 5th July, 1951. (683118.)

16125. Akt.-Ges. Brown, Boveri & Cie.—Automatic alternating current arc welding device. 6th July, 1951. (682938.)

16329. Philips Electrical Industries, Ltd.—Shrouded electromagnetic apparatus. 10th July, 1951. (683053.)

17160. British Thomson-Houston Co., Ltd.—Methods of testing lamp cathodes. 19th July, 1951. (683120.)

25529. Thorogood, J. E.—Television apparatus. 26th February, 1952. (682760.)

STREET LIGHTING NOTES

THE third stage of SPALDING's scheme for converting the street lighting from gas to electricity is to be put in hand shortly.

LEAMINGTON Highways Committee is recommending that electricity should replace gas for side street lighting.

The Ministry of Transport has refused to sanction the conversion of the main street lighting at WINSFORD to electricity.

REDDITCH Public Works Committee is protesting to the Minister of Transport against the withholding of sanction to part of the town's scheme for improved lighting.

DIDCOT Council is seeking sanction to a £2,153 scheme for improved main street lighting.

CONSETT (Co. Durham) U.D.C. has submitted plans to the North Eastern Electricity Board for extending street lighting from Leadgate to Iveston.

The Royal Fine Art Commission has recommended the use of steel columns for a section of WARWICK's new street lighting system. In reporting the Commission's decision the Watch Committee states that it has reluctantly approved the use of steel columns for supporting the lamps in High Street, Jury Street and Smith Street, but is still of the opinion that concrete columns should be used throughout the contract.

The Ministry of Transport has approved DARLINGTON Town Council's plans for installing sodium electric lamps in Haughton Road, and the North Eastern Electricity Board has estimated the cost at £9,000. The Ministry has approved the installation of similar lighting in North Road during the year 1953–54 at a cost of £5,000.

COCKERMOUTH U.D.C. has been authorized by the Ministry of Transport to spend £2,000 on the installation of fluorescent lighting in Main Street, Station Street and part of Station Road.

CHESTER Corporation Improvements Committee has approved schemes submitted by the Merseyside and North Wales Electricity Board for the provision of 400 W mercury vapour discharge lanterns in Christleton Road (£512), tungsten lighting at Boughton (£493) and improved lighting in Liverpool Road (£721)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Fleetwood.—28th October. Town Council. Storm water pump (alternatively a fixed duty pump) for sewerage scheme. J. H. Haiste & Partners, 4, Queen's Square, Woodhouse Lane, Leeds.

Formosa.—TAIPEI.—17th October. Central Trust of China. Spare parts for mercury arc rectifiers and electrical parts. (C.R.E. 30978/52. Ten/4817.)* 20th October. Insulating materials. (C.R.E. 32407/52. Ten/4802.)* Electrical control gear. (C.R.E. 32425/52. Ten/4823.)* Telephone equipment. (C.R.E. 32427/52. Ten/4854.)*

India.—NEW DELHI.—10th November. Two 500 kW rectifier substation equipments. (C.R.E. 32832/52. Ten/4831.)*

New Windsor.—8th November. Town Council. Lamps, fittings and cables for one year ending 31st December, 1953. Borough engineer, Kipling Memorial Building, Alma Road, Windsor.

Sheffield. — 17th October. Town Council. Electrical installation, Holt House Infants' School, Abbeydale. City architect, Town Hall.

South Africa.—CAPE TOWN.—23rd October. Electricity Department. Overhead line equipment. (C.R.E. 32683/52. Ten/4849.)* 7th January. Centralized control equipment for electric water heaters, street lighting and other services. (C.R.E. 32761/52. Ten/4843.)*

Tewkesbury.—8th November. Corporation. Street lighting equipment. (See this issue.)

Turkey. — ANKARA. — Bureau of Airports, Ministry of Public Works. Lighting installations at three airports. (C.R.E. 32995/52. Ten/4850.)*

Uruguay. — MONTEVIDEO. — 24th October. Usinas Electricas y Telefonos del Estado. Supply of 20,500 fuse plugs. (C.R.E. 32319/52. Ten/4848.)* 2nd December. Construction of the first stage of the western circuit of the national electric power network. (C.R.E. 29513/52. Ten/4549A.)*

27th October. Ministerio de Salud Publica. Automatic telephone exchange. (C.R.E. 33024/52. Ten/4835.)*

24th December. Administracion Nacional de Puertos. Radio telephone and telegraphic equipment. (C.R.E. 33023/52. Ten/4847.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

London.—L.C.C. Housing Committee. Supply and installation during 1954 of 100 electric passenger lifts at various housing estates (£230,210).—Waygood Otis, Ltd.

BATTERSEA.—Baths and Wash-Houses Committee. Recommended. Renewal of the electrical installation at Latchmere Road Baths (£2,885).—London Electricity Board.

Northumberland. — Education Committee. Electrical installations in temporary classrooms at Gosforth County Mixed School (£133), Monkseaton County Mixed School (£164), Ponteland County Primary School (£136), Gosforth Grammar School (£149) and Lemington Grammar School (£140).—Bonham Electrical Co., Ltd. Electrical work at Newton-on-the-Moor County Primary School.—J. & A. Oliver, Ltd. Installation of an electric boiling pan, etc., at Belford County Primary School (£120).—I. & E. Morton.

Sheffield.—Corporation. Electrical installations in 652 dwellings on the Hackenthorpe estate, 54 dwellings on the Basegreen estate and 50 dwellings on the Birley estate (£10,895).—M. J. Gleeson (Contractors), Ltd.

Education Committee. Recommended. Electrical installation works at Hurlfield Secondary Boys' School (£6,285, subject to variations in cost).—A. Holmes.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ayr.—Rebuilding bakery (after fire), Boswell Park; James Gilchrist, Ltd.

Belfast.—Mental hospital, Muckamore; Northern Ireland Hospitals Authority, 58, Howard Street.

Houses and flats (59), Crumlin Road; housing architect, Chichester Street.

Blackburn.—New workshops for the blind; borough engineer, Town Hall.

Blaenau Ffestiniog.—New factory for disabled; M. T. Pritchard, architect, Church Street, Blaenau.

Boldon (Co. Durham).—Houses (40), Section 3 of Boldon Colliery housing scheme, for U.D.C.; J. T. Edmondson, surveyor.

Bradfield.—Houses (61), on six sites; and 100 "Orlit" type houses; clerk to R.D.C., Blagrave Street, Reading.

Bradford.—Houses (232), Buttershaw estate; W. H. Leathem, town clerk.

Brighton.—Flats (268), houses (66) and maisonnettes (12) at Craven Vale; town clerk.

Old people's bungalows (14) at Manor Farm estate; Rice & Son, Ltd.

Bristol.—Block of flats, with boiler house, etc., at Redcliffe; J. N. Meredith, city architect, College Green, 1.

Bromsgrove.—School at Lickey Grange for Royal Institution for the Blind; J. A. Chatwin & Son, architects, York House, Great Charles Street, Birmingham.

Bury St. Edmunds.—Flats (42), Mildenhall Road; borough surveyor.

Castleford.—Houses (204), in four groups, on Ferry Fryston estate; Needham, Thorp & White, architects, 6, High Petergate, York.

Chester.—Works extensions; Wolverhampton Corrugated Ironworks Co., Mersey Ironworks.

Coventry.—R.C. school, Penny Park Lane; J. R. Sidwell, architect, 27, Union Street, Coventry.

Crawley.—Printing works; Lloyd's Register of Shipping, 71, Fenchurch Street, E.C.3.

Crayford.—Dwellings (103), Northend Road; U.D.C. surveyor.

Daventry.—Houses (14), West Haddon; R.D.C. surveyor.

Dover.—Houses and flats (154), on sites at Aycliffe, Buckland and Stembrook, during 1953; borough surveyor, Brook House.

Duston (Northants).—R.C. church at Peveril Road; Sir John Brown, A. E. Henson & Partners, architects, 30, Billing Road, Northampton.

East Kilbride.—Secondary school; Wm. Watt, architect, Albert Street, Motherwell.

East Suffolk.—Grammar school at Stowmarket (£130,000) and modern school at Woodbridge (£95,000); E. J. Symcox, county architect, County Hall, Ipswich.

Eccles.—Further 36 houses at Ellesmere Park estate; W. Fearnley & Sons (Salford), Ltd., Constance Works, Eccles New Road, Salford.

Glendale.—Houses (43), Wooler, for R.D.C.; Reavell & Cahill, Lloyds Bank Chambers, Alnwick.

Gosport.—Lock-up shops, maisonnettes and garages on Rowner and Woodcot housing estates; E. Addenbrooke, town clerk, Town Hall.

Grimsby.—Houses (100), Immingham; R.D.C. architect.

Harlow.—Grammar school; Richard Sheppard & Partners, architects, 15, Bedford Place, W.C.1.

Hebburn-on-Tyne.—Houses (32), adjoining Mill Lane, for U.D.C.; R. C. Bestow, Council Offices, Hebburn, surveyor.

Hemsworth.—Houses (50), Ryhill parish; S. Price, R.D.C. surveyor, Brierley Hall, Brierley, near Barnsley.

Hendon.—Shops and maisonnettes on sites at Cricklewood and Hendon; A. O. Knight, borough surveyor, Town Hall, N.W.4.

Lancaster.—Houses (66), Esh Winning; J. A. Routledge, R.D.C. surveyor, Council Offices, Dalton Square.

Leeds.—Improvements to Town Hall (£12,000); city architect.

Liverpool.—Rebuilding large premises at 94, Old Hall Street, for Pierce Williams; Williams & Kelly, architects, 34, Castle Street.

London.—Catford.—Flats (42), Bromley Road; Wates, Ltd., 1258, London Road, S.W.16.

Hackney.—Flats (45), Upper Clapton Road; borough engineer.

Maidstone.—Houses (72), on sites at Coxheath, Marden and Yalding; G. G. Letchford, clerk to R.D.C., 26, Tonbridge Road.

Maltby.—Extension to grammar school for West Riding C.C.; D. B. Jenkinson & Son, architects, Imperial Buildings, Rotherham.

Manchester.—Filling and service station at Ardwick Green South and Brunswick Street for Esso Petroleum Co., Ltd.; J. G. L. Poulson, architect, 29, Ropergate, Pontefract, Yorks.

Oldham.—Additional classrooms at Limehurst Primary School; schools architect, Education Offices.

Potters Bar.—Dwellings (80), Oakmere estate; U.D.C. surveyor.

Renfrew.—Terminal buildings at Airport; W. H. Kininmonth, architect, 16, Rutland Square, Edinburgh.

Romford.—Dwellings (136), with shops and flats, Heaton Grange estate; J. Twinn, town clerk, Town Hall.

St. Albans.—Houses (66), Park Street Lane housing estate; architect to R.D.C., 43, Upper Lattimore Road.

Spilsby (Lincs).—Conversion of Toynton Hall into offices; W. Wright & Son (Lincoln), Ltd., Lincoln.

Standish.—Further 50 houses at Rectory Lane site; U.D.C. surveyor.

Stockport.—Chest clinic at Stepping Hill Hospital; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester.

Sunderland.—Extensions to factory; Fordham & Co., Ltd., Pallion estate, Sunderland.

Swansea.—Works extensions; Imperial Chemical Industries, Ltd., Waunarlwydd.

Flats (56), Penlan; borough architect.

Tynemouth.—R.C. church, Wallsend Road, North Shields; R. Burke, architect, Lambton Road, Jesmond, Newcastle-on-Tyne.

Presbyterian church and hall, Verne Road, North Shields; Tasker & Child, architects, 25, New Bridge Street, Newcastle-on-Tyne.

Stores, workshops and canteen at Coble Dene Yard for the Tyne Improvement Commission; Marshall & Tweedy, architects, 36, Blackett Street, Newcastle-on-Tyne.

Walsingham.—Houses (42), on sites at Blakeney, Fakenham and Hindringham; R.D.C. housing officer, 10, The Square, Fakenham, Norfolk.

Wembley.—Administration and welfare blocks, houses, conveniences, etc., at Carpenders Park Cemetery, near Watford; borough treasurer, Wembley Town Hall.

Wisbech.—Factory; Metal Box Co., Ltd., The Langham, Portland Place, W.1.